INDUSTRIAL MEDICINE AND SURGERY

INDUSTRIAL MEDICINE

The Journal of Medicine in Industry

This Journal is dedicated to the advancement of sound industrial medicine, including the surgery of industrial trauma. To that end its varying contents will embrace scientific papers, reports, digests, news items and official statements, together with editorial comment. The editorial policy is to avoid undue censorship. Some contributions ably prepared will be published although contravening the personal opinions of the editors. Care will be exercised in checking the accuracy of known facts, as printed, but in all other respects statements and opinions are those of the author and may not be shared by the editors. On any article, the editors reserve the right to comment favorably or otherwise, in the current or any subsequent issue. On this basis, contributions are invited. The opinions expressed in any contributions, including the editorials of this Journal, do not necessarily reflect the attitude or opinions of any associated organization.

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INDUSTRIAL MEDICINE AND SURGERY
MARCH, 1957

What the Employee Thinks of His Medical Department

A Medical Department Survey—Detroit Area Michigan Bell Telephone Company

WILLIAM JEND, Jr., M.D., Medical Director

IN ORDER to find out how our employees felt about the Medical Department and to obtain their ideas for improving it, a comprehensive questionnaire was mailed to 1,100 Michigan Bell people in the Detroit metropolitan area in January, 1955.

The survey sample, in which there were no duplications, consisted of random samples of 700 employees at all levels, 50 first level supervisors, 50 supervisors of district level and above, and 300 employees at various levels who had been recent patients in the Medical Department.

The Survey Research Center was responsible for mailing the questionnaires and for tabulating the results. There seemed to be much interest in the subject, and 508 replies were received for a 46% participation rate. This is considered an adequate sample for statistical purposes.

Scope of the Survey

SEVEN general subjects with numerous subdivisions were covered by the questions. They were as follows:

1. General information about the employee.
2. Use of the Medical Department: (a) recency of last visit; (b) total number of visits; (c) reason for visits.
3. Personal attitude toward the Department: (a) feeling of interest by the Department in patients as individuals; (b) confidence in the Department; (c) rating the Department.
4. Specific work of the Department: (a) satisfaction with various phases of a visit to the Department; (b) explanation of examinations and tests; (c) letters and reports received from the Department; (d) interest in seeing the same doctor on each visit; (e) visits by appointment; (f) visiting nurse program; (g) confidential nature of medical information.
5. Opinion of employee's physician about the Department.
6. Factors outside the Department affecting employee's opinions: (a) previous explanations to employees of services and functions of Department; (b) feeling of being forced to visit Department unnecessarily; (c) denied opportunity to visit Department.
7. Questions asked only of Supervisors concerning their administrative relationships with the Department: (a) helpfulness of Department in day-to-day problems; (b) satisfaction with individual supervisory contacts; (c) care of company accidents; (d) supervisor's personal opinion of employees' attitude toward Department.

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TABLE I.
SAMPLE AND PARTICIPATION

Employee Groups Surveyed	Number in Group	Number of Responses	By Departments							By Sex	
			Plt.	Trf.	Acctg.	Coml.	Eng.	Dir.	Other	M.	F.
Random (All Levels)											
Number	700	299	110	66	29	47	13	10	24	139	152
% Responses		43	37	22	10	16	4	3	8	46	51
First Level Supervision											
Number	50	42	10	3	10	13	—	5	1	11	30
% Responses		84	24	7	24	31	—	12	2	26	71
District Level and Above											
Number	50	42	9	9	6	8	3	2	5	41	1
% Responses		84	21	21	14	19	7	5	12	98	2
Sub-Total											
Number	800	383	129	78	45	68	16	17	30	191	183
% Responses		48	34	20	12	18	4	4	8	50	48
Recent Patients											
Number	300	125	41	35	5	22	4	5	13	53	71
% Responses		42	33	28	4	18	3	4	10	42	57
Total											
Number	1100	508	170	113	50	90	20	22	43	244	254
% Responses		46	33	22	10	18	4	4	8	48	50

Note: Certain categories do not total 100% because questionnaires were not completely answered.

Extent of Participation

TABLE I shows the extent of participation by departments and by the various groups included in the survey. Participation by sex is also shown in total for each of the groups. It is interesting to note that about the same number of men and women answered the questionnaire.

The following shows the source of selection of the four groups making up the survey:

Source	Group	No. in Group
Payroll lists	Random	700
Organization charts	First level supervision	50
Distribution List No. 2	District level and above	50
Medical Department Log Book	Recent patients	300
	Total	1100

Findings

TABLE II shows the number and recency of visits to the Medical Department for all groups included in the survey.

Approximately one-half of all the employees in the survey had been there within the last six-month period. About 75% of the total had been there within a two-year period.

Within the last two years, 76% of the men and 74% of the women visited the Department, while 4% of both men and women had never been to the Medical Department. This is probably the result of transfers from outstate locations to the Detroit metropolitan area.

Patient Attitudes

THE most favorable attitudes were expressed by employees who had been recent patients or who frequently visited the Medical Department and by supervisors.

Chart 1 groups the responses according to the recency of the visit and Chart 2 arranges them by frequency of visits. Each of the subgroups is shown as percent of the total and has also been rated for degree of favorable attitude by a scale score.

A scale score is often computed in attitude

TABLE II.
USE MADE OF THE MEDICAL DEPARTMENT

Employee Groups Surveyed	Number in Group	Number of Responses	Recency of Visits			Number of Visits		
			Last Six Months	Six Months to Two Years	Over Two Years	1-3	4-10	Over 10
Random (All Levels)								
Number	700	299	98	108	74	122	99	63
% Responses		43	33	36	25	41	33	21
First Level Supervision								
Number	50	42	14	12	14	9	21	11
% Responses		84	33	28	33	21	50	26
District Level and Above								
Number	50	42	13	12	14	9	13	20
% Responses		84	31	28	33	21	31	48
Subtotal								
Number	800	383	125	132	102	140	133	94
% Responses		48	33	34	27	37	35	25
Recent Patients								
Number	300	125	105	17	—	27	47	48
% Responses		42	85	14	—	22	38	38
Total								
Number	1100	508	230	149	102	167	180	142
% Responses		46	45	29	20	33	35	28

Note: Certain categories do not total 100% because questionnaires were not completely answered.

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surveys to measure the degree of favorable opinion about a subject. In this survey, the responses to the following three questions were scored together to provide this measurement of attitude:

1. Do you feel that the Medical Department is interested in you as an individual?
2. How much confidence do you have in the Medical Department?
3. All things considered, how would you rate the Medical Department?

The scale range was from 0 to 50 with the highest number indicating the most favorable viewpoint. The average scale scores of the participants making up each subgroup on the charts are recorded by a black diamond.

Chart 3 shows the percent of response for each of the four groups in the survey. The scale score is also shown. This complements the findings of Charts 1 and 2 in showing that recent and frequent visitors and supervisors expressed the most favorable attitudes toward the Medical Department.

Supervisors' Opinions

CHART 4 compares the responses on the three general attitude questions with questions about actual visits to the Medical Department and the question asking the supervisors' opinion of what their people thought of the Medical Department.

Supervisors tended to believe that their employees had a less favorable opinion of the Medical Department than actually existed. About 60% of the employees rated the Medical Department as quite good or excellent and 28% as fairly good, as compared to supervisors' opinions of 25% quite good and 47% as fairly good.

This information might be interpreted to mean that what people hear by word of mouth about the difficult and so-called problem cases tends to cause negative attitudes toward the Medical Department as differentiated from personal experience as patients.

CHART 1.

RECENCY OF VISITS AND ATTITUDES TOWARD DEPARTMENT

About how long ago was your last visit to the Medical Department in the Bell Building?

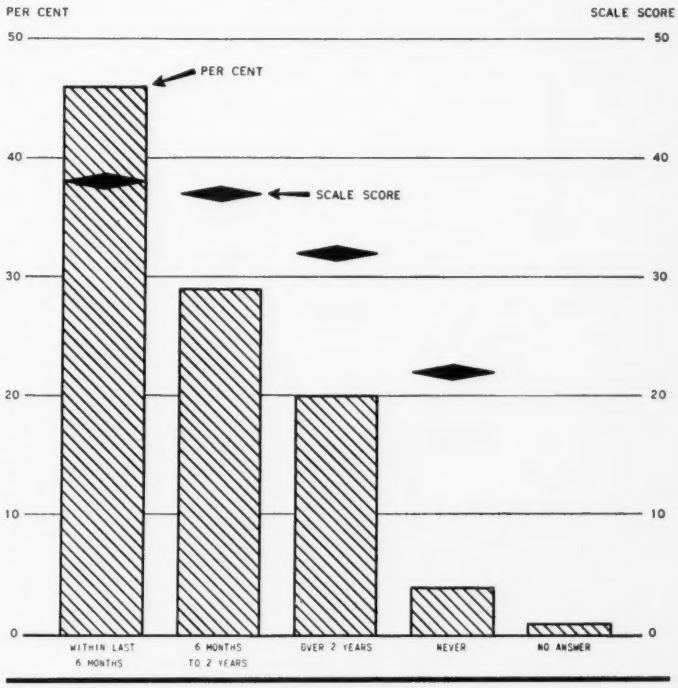

CHART 2.

FREQUENCY OF VISITS AND ATTITUDES TOWARD DEPARTMENT

About how many times do you think you have been to the Medical Department in your total service with the company?

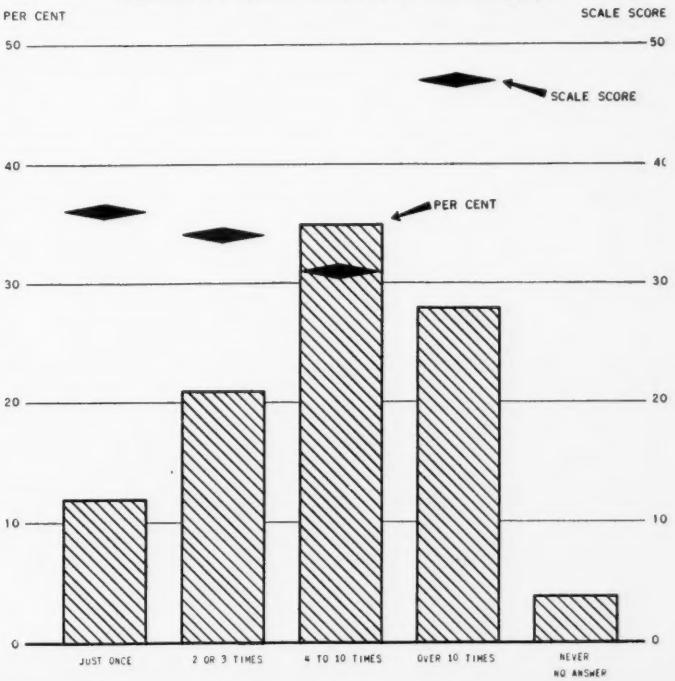

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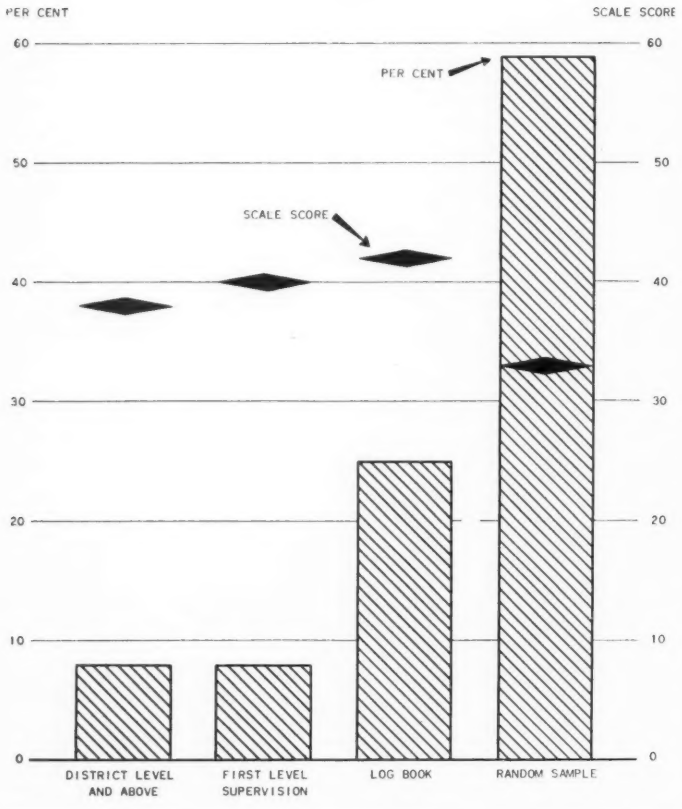
CHART 3.

ATTITUDES TOWARD DEPARTMENT BY SAMPLE GROUPS

Percentage of each group of the total response and a comparison of their attitudes.



Critical Attitudes

ANOTHER aspect of this problem is that critical attitudes are often formed by factors beyond direct control of the Medical Department. A high-low comparison study of the group with the most favorable viewpoint and the group who were least favorable (Chart 5) brought out the fact that in the latter group 21% had been called upon to make what they thought to be unnecessary visits and 10% had been denied an opportunity to visit the Medical Department, whereas none in the favorable group had had either experience. A much higher percentage of those with favorable attitudes than those with unfavorable attitudes had had the services of the Department explained to them. Incidentally, about 10% in each group were supervisors.

Better Understanding Needed

THE MOST striking impression from the survey is the tremendous amount of misunderstanding and lack of information about the functions and services of the Medical Department. Many of the comments dealt with the point that an employee expected

CHART 4.

SUPERVISORS' OPINIONS VS OPINIONS IN GENERAL

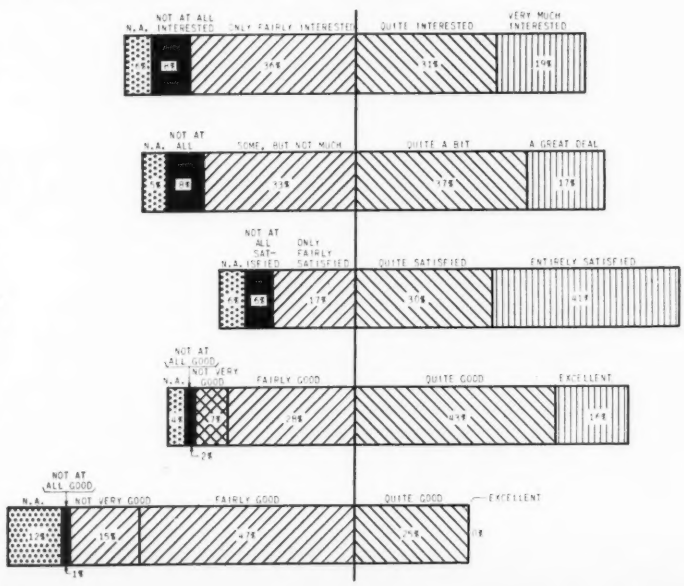
Question No. 4: Do you feel that the Medical Department is interested in you as an individual?

Question No. 5: How much confidence do you have in the Medical Department?

Question No. 6: When you visited the Medical Department, how satisfied were you with various aspects of the visit? (Chart 6 is a detailed analysis of the multipart question.)

Question No. 17: All things considered, how would you rate the Medical Department?

Question No. 22: How do you think most employees in your department feel about the Medical Department? (Supervisors only.)



to receive extensive treatment and was disappointed when this was not given. The fact that often he was referred to his family physician for treatment was interpreted as being due to a lack of professional competence on the part of staff physicians rather than to the proper limitations of industrial medicine to diagnosis and emergency treatment only.

In company accident cases, where the responsibility of the Medical Department is clearly defined, a favorable response was noted.

Only about 30% of the random sample participants and recent patients could recall having had the services of the Medical Department explained to them. Indeed, only 50% of district-level-and-above-supervisors answered this question in the affirmative.

Reactions to Medical Department

ANALYSIS of the multipart question (Chart 6) having to do with specific aspects of a visit to the Department disclosed that

CHART 5.
HIGH-LOW STUDY

(A high group composed of 64 employees, including nine supervisors, and a low group composed of 63 employees, including seven supervisors, were selected on the basis of their responses to the general attitude question.)

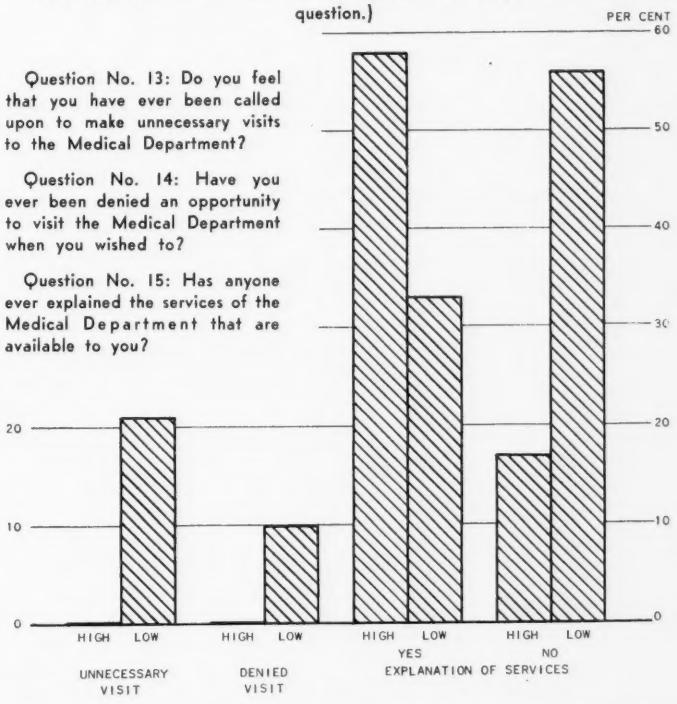

PER CENT
60
50
40
30
20
10
0
Question No. 13: Do you feel that you have ever been called upon to make unnecessary visits to the Medical Department?
Question No. 14: Have you ever been denied an opportunity to visit the Medical Department when you wished to?
Question No. 15: Has anyone ever explained the services of the Medical Department that are available to you?
HIGH
LOW
UNNECESSARY VISIT
DENIED VISIT
YES
NO
EXPLANATION OF SERVICES

CHART 6.
SPECIFIC REACTIONS OF VISITORS TO MEDICAL DEPARTMENT

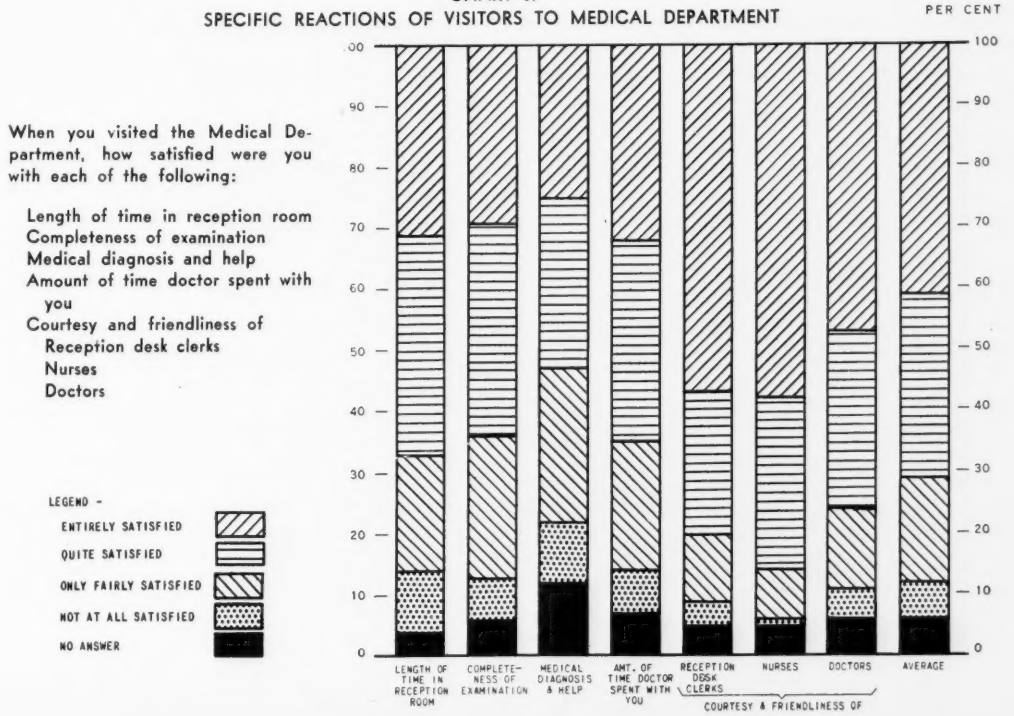


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CHART 7.
SPECIFIC REACTIONS TO OTHER ASPECTS OF MEDICAL DEPARTMENT SERVICE

Question No. 9: How do you feel about whether or not you see the same doctor on each visit?

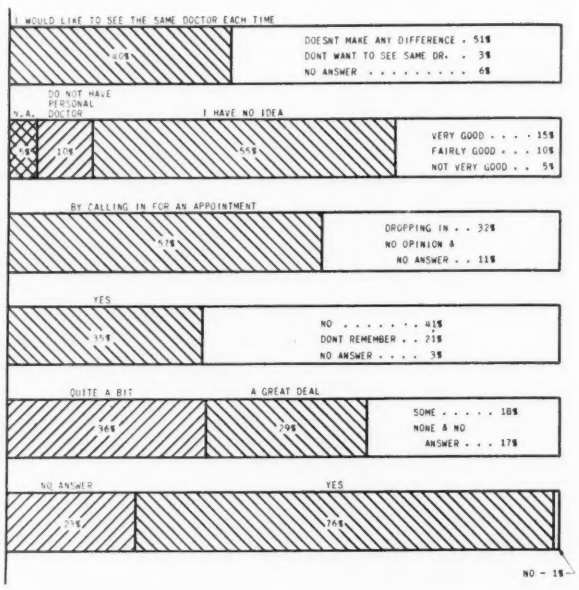
Question No. 10: How do you think your personal doctor feels about our Medical Department?

Question No. 11: Excluding accident cases or acute illness, how do you feel that routine cases should be handled by our Medical Department?

Question No. 15: Has anyone ever explained the services of the Medical Department that are available to you?

Question No. 19: How much does the Medical Department help you in the day-to-day medical problems you encounter in your Department?

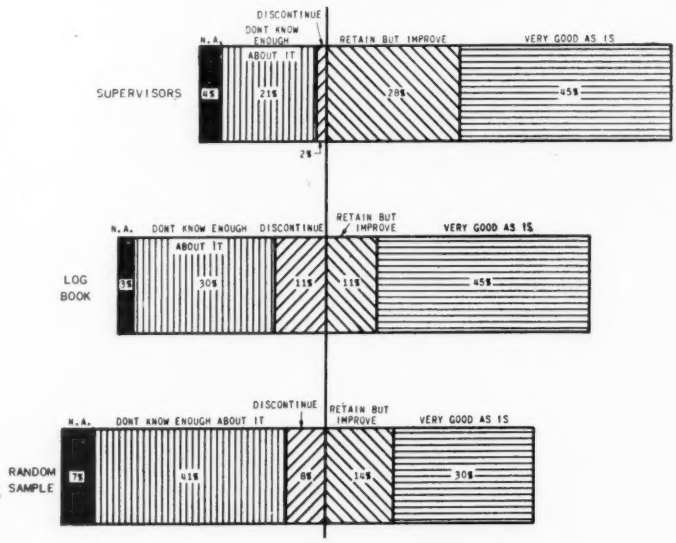
Question No. 21: Do you feel that on-the-job accidents receive prompt and proper care?



the length of time spent in the reception room and the medical diagnosis and help drew the most unfavorable responses. The degree of dissatisfaction with the medical diagnosis and help was tempered by the more favorable views expressed on this question of the completeness of the examinations and the amount of time that the doctor spent with the patient.

These facts may be reasonably interpreted as reflecting the point previously mentioned that the limitations of industrial medicine are often not understood. Furthermore, there is contrast in the close relationship that exists between an individual and his personal physician as compared with a company doctor who is not permitted to give extended treatment and, therefore, must in many instances refer the employee-patient to his family physician for further diagnosis and treatment. Many times employees interpret this to mean that the company doctor is not interested or does not quite know what is wrong and is anxious to refer the employee to someone else. In this question, the courtesy and friendliness of the staff received the most favorable comment, with nurses particularly favored.

CHART 8.
VISITING NURSE PROGRAM
What do you think of the plan where the Visiting Nurses visit the homes of employees who are sick?



Reactions to Other Medical Department Services

CHART 7 shows the percentage of responses to general questions about how employees and supervisors felt regarding other aspects of Medical Department operations.

Only 35% indicated that anyone had ever explained the services of the Medical Department that are available to employees. This again shows

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the need for supplying information about the purposes and services of the Department through all possible ways.

While 51% indicated that it did not make any difference whether or not they had the same doctor upon each visit to the Medical Department, 40% felt that seeing the same doctor would be advantageous.

A good majority of employees, including supervisors, indicated their preference for the appointment system except in emergency cases. According to the written-in comments, they felt that the appointment system would provide a more systematic and equitable use of the Department and would reduce the waiting time.

Question No. 19 and Question No. 20 were answered only by supervisors. Sixty-five percent felt that the Medical Department was either "quite a bit" or "a great deal" of help to them in handling the day-to-day medical problems that occurred in running the job. Only 1% did not feel that on-the-job accident cases received prompt and proper care.

Opinions of Visiting Nurse Program

THE PART of the visiting nurse program having to do with home visits received much comment and criticism (Chart 8). Supervisors were much more favorable to the program than those in either the random or log-book samples, and in the latter groups approximately 10% said that it should be discontinued. While there was much praise for the nurses as individuals, the written-in comments concerned particularly the fact that the nurses do not visit all cases of a similar type, no advance notice of a visit is received, visits by the nurses to hospitals seem unnecessary, and some supervisors appear to misuse the program.

Summary

1. THERE is fairly widespread use of the Department, but not to its fullest extent.

2. A generally favorable attitude was noted, particularly among those who had visited the Department recently and among supervisors.

3. Supervisors tended to believe that their employees had a less favorable opinion of the Medical Department than was shown by the responses of the employees themselves.

4. There is much misunderstanding and lack of information about the purposes and functions of the Medical Department. This seemed often to be reflected in an unfavorable attitude toward the Department. Such attitudes were also fostered when employees were either denied the opportunity to visit the Department or were requested to do so against their wish.

5. Many employees who expressed dissatisfaction with the medical diagnosis and help seemed to expect extensive treatment well beyond the generally recognized scope of an industrial medical service.

6. Employees and supervisors alike commented favorably on the principle of periodic examinations. Many comments urged the expansion of this program.

7. The majority of employees and supervisors were in favor of handling all visits, except emergencies, on an appointment basis as a means of reducing the waiting times of patients.

8. Many participants seemed to feel that the visiting nurse program is maintained as an adjunct to supervision rather than to be helpful to employees.

9. There were many comments calling for more friendly and sympathetic care of patients and a more effective system of reporting examinations and tests.

Proposed Improvements

EMPHASIS on friendly and sympathetic care of patients by the entire staff.

Placement of all but emergency visits on an appointment basis.

Continuation of efforts to reduce waiting time of patients.

Preparation of an information booklet about the Medical Department for distribution to all Michigan Bell people in the Detroit area.

Expansion of the periodic health examination program.

Strict adherence to the confidential nature of medical information.

Revision of the visiting nurse program.

Medical-Identification

A MEDICAL-identification card with a complete medical history — what was done, when, and what for — was proposed in an article in *Saturday Evening Post* by I. Phillips Frohman, M.D. He suggests that a joint committee, representing the medical professions, be appointed to draft an appropriate card and universal medical code that would everywhere be understood by doctors. All pertinent information could be entered on a folding card small enough to fit in a wallet. Dr. Frohman believes that as a result, "the doctor, seeing an emergency patient for the first time, will not be fumbling in the dark with the patient's life in the balance."

—From *American Journal of Public Health*, November, 1956.

XUM

Clinical Observations of an Analgesic Formulation in Industrial Practice

GILBERT B. MEYERS, M.D., Oreland, Pennsylvania

TREATMENT of 'on-the-job' illnesses and injuries is a basic responsibility of the industrial physician. Such treatment must be adequate to relieve symptoms promptly, and permit the patient to be ambulatory with full command of his faculties if he is to return to work.

A major cause of incapacity among workers is pain. As is often the case, the specific cause of the pain per se is not the disabling factor. Minor fractures, lacerations, contusions, abrasions, sprains, bursitis, neuritis, neuralgia, and myalgia are some of the conditions that result in lost time from work chiefly owing to the associated pain.

It has been my experience in industrial medical practice that in the immediate post-traumatic period, anxiety, in addition to pain, is an important factor in causing disability. Anxiety is precipitated by the patient's thoughts of what has happened; what might have happened; remorse over a broken safety record; criticism from supervision or fellow workers; concern over worrying the spouse; loss of earnings; lost production; spoiled work; or of other physical or work sequelae. The physician must be prompt in relieving pain and anxiety. Pain and fear being thus minimized, the disability can be evaluated objectively.

In seeking a suitable medication for relief of post-traumatic pain and apprehension, I have found the usual analgesic compounds ineffectual. Stronger preparations containing narcotics are not satisfactory for patients remaining ambulatory at work. A formulation having an analgesic and sedative action is, therefore, required. Phenaphen* was tested because it appeared to have a formula which would give the desired physiological effects.

Methods, Observations, and Results

THE TEST preparation was prescribed for 137 employees who came to the Medical Department of a large electric storage battery manufacturer. All complained of pain. The group was composed of 28 office, 53 light factory, and 56 heavy factory workers who had a variety of complaints. The seven females and 130 males had a mean age of 5[illegible] years, with extremes of 28 and 62 years.

The number treated for the following conditions was 10 for fracture, 11 for laceration, 35 for contusion and abrasion, 42 for sprain, nine for bursitis, 20 for neuritis, neuralgia and myalgia, and 10 for miscellaneous disorders.

The anatomical location of these conditions was the head and neck in 13 patients; chest and upper extremity in 60; trunk and lower extremity in 40; and low back in 24.

The subjects described the intensity of the pain as severe in 26 patients, moderate in 86, and mild in 25.

The predominating character of the pain was sharp in 47 patients, dull in 67, and throbbing in 23.

The total number of capsules prescribed for the corresponding number of patients was:

Total Prescribed	Number of Patients
6	16
8 - 10	39
12	30
14 - 16	14
18 - 20	15
24 - 30	13
Over 30	10

The usual single dose was one capsule. The frequency of administration was:

Frequency	Number of Patients
Q. 3. H.	68
Q. 4. H.	17
T. I. D.	19
Q. I. D. (p.c. and h.s.)	33

In addition, the patients were told the medication could be taken at bedtime and repeated in three or four hours during the night if necessary.

As to results, medication was required for the following number of days:

Number of Days	Number of Patients
One	56
Two	40
Three	25
Four	1
Five	7
Six	6
Seven	2

*Phenaphen®, A. H. Robins Company, Inc., Richmond, Virginia. Formula per Capsule: Phenacetin, 194.0 mg.—Aspirin, 162.0 mg.—Hyoscyamine Sulfate, 0.031 mg.—Phenobarbital, 16.2 mg.

Subjective relief obtained was excellent in 50 patients, good in 73, fair in eight, and poor in six.

Patients were questioned regarding the following side effects: sleeplessness, drowsiness, weakness, dizziness, gastric upset, sweating, or other complaint. Of the 137 in the test group 127 reported no untoward effect, nine reported drowsiness, and one reported heartburn. The immediate disposition of the patients treated was: 103 were returned to regular work, 24 were returned to limited work, and 10 lost time.

Comment

THE USE of an analgesic-sedative formulation for 'on-the-job' treatment of occupational and nonoccupational conditions with the common symptom of pain has been demonstrated.

The diagnosis, the type of work, the age of the worker, the anatomical location, and the intensity and character of the pain varied considerably. The majority of the patients required 12 or less capsules of the test formulation and, with only two exceptions, one capsule per dose was sufficient. The first dose was usually given in the Medical Department as part of the initial treatment. The patients were advised that the medication should be taken at bedtime. I feel this helped in a number of individuals, since a frequent cause of disability the following day is a sleepless night.

Treatment with the test compound gave relief from discomfort but did not dull the senses sufficiently to interfere with normal activities. Apprehension which accompanies pain, especially posttraumatic pain, was minimized. Medication was needed three days or less in most cases; actually, 56 of the 137 patients required medication for only one day, and 40 for two days. In the majority of cases there was good-to-excellent relief. Ten workers lost time, three of whom had fractures.

Summary

THE analgesic formulation selected was found to be safe and satisfactory for use in an industrial medical practice.

Prompt treatment with this analgesic-sedative preparation helped alleviate pain and anxiety satisfactorily in 123 of 137 cases, or 89.8%.

(504 Willow Road.)

Real Reason: Poor Supervision

THE "EX-EMPLOYEE" may be a new and hitherto overlooked source of workers for hard-pressed business and industrial employers. This was suggested in a study at the University of California at Los Angeles by Dr. Wayne L. McNaughton, of the Graduate School of Business Administration. The investigation was conducted with the cooperation of a large western aircraft company whose rate of employee turnover was 5,600 separations a year from a work force of 10,000. It covered all former workers who had been gone from two to 11 months. For statistical reasons, Dr. McNaughton's analysis was limited to employees who had resigned during the second, seventh and eleventh months previous to the study. Each of the ex-employees received a questionnaire with a covering letter assuring them their answers would have no effect on their record. The ex-employees were asked: (1) why did you quit your job with the company?; (2) would you like to return to the company?; (3) what did you like best about the company?; (4) what did you dislike most about the company. One of the first things Dr. McNaughton noted was that the reasons given in the confidential questionnaire for leaving the company were quite different from those given at the time of separation. Most of the ex-employees had told interviewers on their departure that they were leaving for "other employment." Other common reasons included "leaving the state," "returning to the farm," "military service," "poor health," and "maternity." The general impression was that the employees were being forced out of the company by forces beyond the employer's control. However, the questionnaires filled out by employees after they had left the job revealed a very different picture. On these the ex-employees emphasized such reasons as "poor pay," "bad supervision," "slow advancement." About 40% of the workers gave a "polite" excuse at the time of leaving, then gave a more truthful answer later. Most disliked by the ex-employees was the poor quality of supervision, 23% of the two-month group so stating. Wages as a disliked factor was reported by 8%, 5%, and 10% of the three groups. Another 5%, 8% and 3% had been dissatisfied with the nature of the job. The remarkable finding of the survey was the number of ex-employees who said they would consider rejoining the company. Three out of four ex-employees who had quit after two months on the job indicated they were still interested in rejoining the company, as were 57% of the group which had quit after 11 months.

—From *Science News Letter*, September 29, 1956.

XUM

Brucellosis as a Cause of Herniated Disk and Spondylitis

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JOSEPH FRANKLIN GRIGGS, M.D., Claremont Medical Research Foundation
Claremont, California

DISEASES of the spine due to infection by Brucella have been reported with sufficient frequency in the literature so that the spine is generally considered to be the most frequent osseous localization of Brucella invasion. As in syphilis and other granulomatous infections, the causative organism is apparently widely disseminated throughout the body in the early stages[13,16,18,21] and may find a permanent habitat in any tissues and organs of the body. Brucellosis is thus capable of simulating almost any other disease.[7,9,10,21,23] Its intracellular habitat[13,14,18] makes complete eradication difficult, even with modern antibiotics.[11,20] Spinal manifestations of brucellosis may therefore occur at any stage of the disease, sometimes becoming evident only many years after first acquiring the infection. It is a serious error to suppose that brucellosis is a self-limited disease. Its pathology places it in the chronic infectious granulomas along with tuberculosis and syphilis. Its onset is frequently insidious with no acute stage discernible.[9,10,22]

Brucellosis is due to infection by Brucella *abortus*, *suis*, or *melitensis*. The reservoirs of the infection are chiefly cattle, hogs, and laboratory cultures. The patients acquire the disease by handling infected animals or their carcasses or by drinking their raw milk or eating the uncooked meat, or by contact with the germs in the laboratory. Pasteurization kills the organism; freezing does not. Properly smoked hams are free of living Brucella, but pickled hams may not be safe.

When invasion by Brucella occurs, disease may or may not result. When the infecting organism is of a highly virulent strain or when the dose is large, an acute hyperpyrexia, debility, hyperhidrosis, and bacteremia are likely to occur within a few weeks or months. The disease often runs a protracted or relapsing course but eventually seems to subside spontaneously or on the administration of antibiotics. This is the well-known acute undulant fever.

About 20% of acute cases continue to complain of ill health indefinitely. Some of these are diagnosed as postinfectious neurasthenia, because they fail to stay well for long, and Brucella can no longer be found in their blood. However, the known granulomatous[13,16,34] and intracellular habitat of Brucella in the tissues, and its marked tendency to dissociate into less virulent forms[28,33] have led other authorities to consider these cases as true postacute, chronic brucellosis, even though some neurosis may also be evident.[9,10,18,22,27,30,36]

The more common form of chronic brucellosis is less well known and much more difficult to diagnose correctly. It apparently results from small infecting doses or less virulent strains of Brucella. The onset is so mild or insidious that undulant fever is not even considered until the disease is of long duration and many other diagnoses have led to varied unsuccessful treatments. The patient's symptoms are often so varied and inconsistent that the initial impression leads to a diagnosis of neurosis. However, brucellosis can be suspected if it is remembered that Brucella may be lodged in any and all tissues of the body, and, like syphilis, becomes the great imitator of other diseases, including mental disease.[27,36] A positive skin test proves only that an invasion by Brucella at some time has been followed by sensitization. It does not prove whether the disease is still present and active, or latent and quiescent. Positive blood cultures are not obtainable in chronic cases except very rarely. Agglutinin titers may be negative or "too low for diagnosis." Brucella complement fixation and opsonic tests may or may not be helpful. Any evidence of possible brucellosis should be given respectful consideration. Comprehensive differential diagnosis is imperative.

X-ray evidence of chronic bone disease, especially a patchy spondylitis or disk degeneration, may support a doubtful diagnostic profile in regard to chronic brucellosis.

Lesions of the Nucleus Pulposus (Intervertebral Disk)

IN BRUCELLOSIS the intervertebral disk is frequently attacked. The consequences are either hernia intraspongiosa of the type of Schmorl's

Presented at a Meeting of the Section on Industrial Medicine and Surgery at the 85th Session of the California Medical Association, Los Angeles, April 30, 1956.

Fig. 1.
Case No. 1: Early bone bridges or parrot beak lesions of anterior L III and L IV.

node, or hernia towards the spinal canal. These processes may be asymptomatic and go on to spontaneous quiescence, or they may produce radicular neuritis, depending on the localization and volume of the hernia. Meningomyelitis may develop if the invader is virulent or poorly resisted.

Anatomically, not only the disk is affected. There is always a participation of the vertebral body and of the soft parts (ligaments). But the more severe clinical symptoms that these patients show, and their consequences, depend mostly on the lesion of the disk.

CASE NO. 1: In 1940, in Serrezuela, a patient showed signs of meningoencephalitis. Studies in de Villafane's clinic confirmed the diagnosis of acute brucellosis with meningoencephalitis localization. In the spine, radiographic changes appeared in the lumbar segment.

Spondylitic lesions of the parrot beak type on

Fig. 2.
Case No. 1: Photograph of autopsy specimen showing multiple disk degeneration and herniation due to brucellosis.

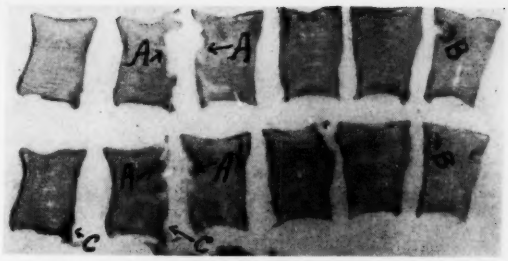

Fig. 3.
Case No. 1: X-rays of anatomic specimens, sagittal sections, showing multiple Brucella lesions.

the lateral margins of the third and fourth lumbar vertebrae came about, with narrowing of the space between the second and third lumbar. The lateral view (Fig. 1) shows lesions of the anterior part of the third and fourth lumbar, and a tendency to form bone bridges at this level. The patient died 14 days after these x-rays. All the neurologic symptoms were interpreted as originating from the meningoencephalitis, which was the cause of the patient's death.

Fig. 2 is a photograph of the autopsy specimen from the 3rd thoracic to the 4th lumbar. It shows: at A, spondylitic lesions of the bodies of the 2nd and 3rd lumbar, with destruction of the intervertebral disk, which herniates distinctly into the spinal canal; at B, part of the nucleus pulposus is invading the vertebral body of the 11th thoracic, through a decay of this vertebra (hernia intraspongiosa or Schmorl's node); at D, can be seen the destruction of the disk between the 5th and 6th thoracic vertebrae. The arrows show disks with distinct tendency to invade adjacent vertebral bodies, the Schmorl's node type.

In the anatomic specimen of the spine, sagittal sections in series were affected. Fig. 3 shows x-rays of two nonconsecutive sagittal sections. At A can be seen the same spondylitic process of Fig. 2 (A); at B, the lesion that Fig. 2 shows in B. In C, are seen the "parrot beaks" of the anterior borders of the 3rd and 4th lumbar bodies which appear in Fig. 1.

It is interesting to point out that although there were only 14 days between the death of the patient and the x-rays of his spine as shown in Fig. 1, the hernia of the disk and the severe spondylitic lesion of the 2nd and 3rd lumbar, which are evidenced by these anatomic specimens, could not be presumed in those x-rays. Only the lesions of the anterior end, the ones of less anatomical significance, showed in the x-rays.

Fig. 4 presents a photomicrograph of a section taken at the level of B in Fig. 2. It proves to be a nodule of hyaline cartilage, with few cells and abundant matrix, placed in the bony areolar tissue of the vertebral bodies. At A can be seen a necrotic zone of this nodule, while B shows its external part, partially calcified. At C is the formation of strong bony trabeculae. This histologi-

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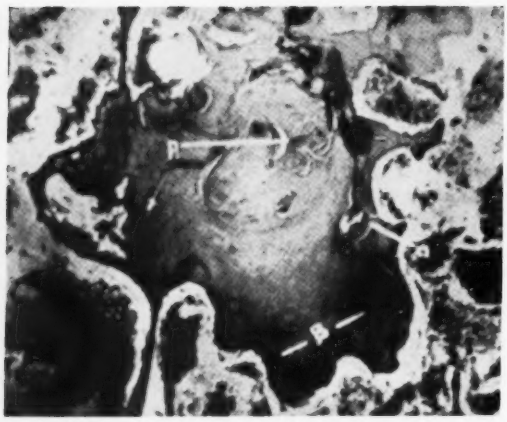

Fig. 4.
Case No. 1: Photomicrograph of Schmorl's node due to brucellar degeneration.

cal study confirms that we were dealing with a hernia intraspongiosa of the nucleus pulposus, i.e., a Schmorl's node.

The characteristic brucellar lesion of these bones is a mononuclear cell granuloma described by Lowbeer[34,35] as follows:

"Microscopically the early phase was characterized by destruction of intervertebral disk and contiguous vertebral bone through the osteoclasts of a granulation tissue composed of mononuclear cells and some polymorphonuclear leucocytes, with formation of small central abscesses showing a tendency to encapsulation in the periphery and to necrosis in the center. The process was less purulent and more limited than that in pyogenic osteomyelitis, and there was more tendency to repair.

"In a later stage large mononuclear cells, fibroblasts and occasional bizarre multinucleated giant cells are prominent as well as extensive formation of new bone around the destructive lesion.

"In a still later phase a large area of disk and bone destruction is encapsulated by a mononuclear cell granuloma which centrally undergoes extensive coagulative necrosis but at the periphery is surrounded by connective scar tissue. The granuloma contains numerous osteoclastic bizarre multinucleated giant cells surrounding bone splinters, as well as tubercle-like nodules composed of nonepithelioid histiocytes. There is formation of new bone at the periphery with formation of bony bridges and exostoses. The process is one of apparently rapid but self limited destruction which soon becomes localized."

Chuinard[29] gives a similar description from other cases:

"The focus of the disease in the vertebrae appears to start near the epiphysis, often spreading to multiple small abscesses or the intervertebral disk, rarely producing collapse of the body but often irregularity, and often narrowing the intervertebral disk. The older lesions are apt to produce ossification, either as spurs from the anterior surfaces of the vertebrae or dense sclerotic areas in the bodies. These dense areas are in contrast to the demineralization usually seen in tuberculosis."

Essential to the understanding of brucellosis as a chronic low-grade infection is the recognition of the intracellular habitat of Brucella where it remains and even multiplies, protected from the destructive power of antibiotics and antibodies by its host's own living cells which surround it.[11,20]

CASE NO. 2: Another interesting case was that of a patient who came from La Rioja suffering acute brucellosis, with a generalized bone marrow aplasia. This patient died four days after admission. Owing to the very serious condition of this patient, and the few days that she lived in our clinic, we could not effect a detailed neurological study, nor a complete study of her spine. X-rays were obtained only of the lumbar region.

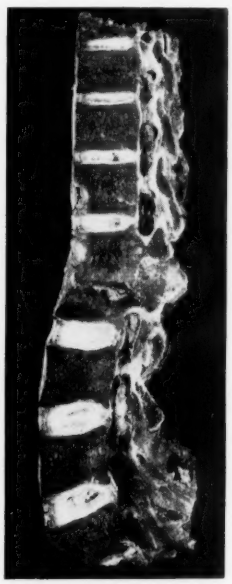

Fig. 5.
Case No. 2: Effacement of spinal canal at level of eighth thoracic disk due to Brucella spondylitis.

At the autopsy, which we request systematically of every patient with brucellosis (Fig. 5), we could see a severe spondylitis, involving especially the 8th and 9th thoracic vertebrae, with disappearance of the intervertebral disk and effacement of the spinal canal at this level. There were lesions in the anterior parts of the bodies of the 7th, 8th and 9th thoracic vertebrae.

The x-ray appearance of the autopsy specimen at this level showed several lesions of the bodies of the 7th, 8th and 9th thoracic vertebrae.

It is well known that myelitis can result from an infectious and parasitic spondylitis when there is severe bone destruction causing compression of the spinal cord by the migration of bone fragments and of the nucleus pulposus, or by the abscesses following these processes. This is not uncommon in tuberculosis or pyogenic (staphylococcus) spondylitis, and in the hydatid cyst of the spine in other processes. But we have not previously heard of medullary compression due to spondylitis in brucellosis. Roger and Poursines,[17] for example, say: "Let us point out that, to the

Fig. 6.
Case No. 4: Narrowing of space between L III and L IV with solitary chronic lesion of L IV and L V.

best of our knowledge, these pseudo-Pott spondylitides of brucellosis do not usually cause nervous complications of medullary compression, as seen in Pott's disease." In the chapter "Considerations on Prognosis, Diagnosis and Therapy," speaking of paraplegias, they say: "A picture of medullary compression appears in certain cases with radicular type pain, spastic paraplegias with defensive reflexes, anesthesia, blockade to the Queckenstedt-Stookey maneuver and quite distinct arrest of lipiodol, but in rosary form (moniliform, candle-drops). In the absence of any Pott's disease (tuberculosis) a tumor of the roots has been suspected, and surgical intervention evidenced an arachnoid suppuration, with positive culture of the Brucella (Pitot)."

A unique case (NO. 3) was that of a child (Béchet, Puig, and Charvet[1]), who died of a peritoneal syndrome. The necropsy revealed a small focus of osteitis of the body of the 1st lumbar vertebra, which took the shape of a collar button extending into both the spinal canal and the abdomen without any major neurological symptoms. But we have not been able to find other cases in which, like the two above mentioned, a compression of the spinal cord may be caused by the projection into the spinal canal of fragments of nucleus pulposus and bone, due to brucellosis.

We have had several opportunities to observe cases of brucellosis which, while showing sometimes severe and other times minimal spondylitis radiologically, had clinical symptoms of medullary or radicular compression. We are herewith reporting one of these cases of radicular compression.

CASE NO. 4 was that of J. P., an Italian farmer, 46 years old. Eight years previously a period of fever appeared, not high but prolonged: six months with a temperature around 38°C (100°F). Later there were pains in the joints of the arms and legs, then a period of deep mental depression. In 1943, lumbar pain appeared and afterwards pain in the sciatic nerve resulted in bed rest for three months. There was a recurrence in 1944, and again in 1945 when he reported for study, complaining of sciatica on the right side. X-ray studies of the spine showed a spondylitic lesion of the 4th and 5th lumbar vertebrae (Fig. 6), apparently an old one, a well-defined and localized process. A lateral x-ray (Fig. 7) shows, where the arrow points, a distinct modification of the disk between the 3rd and 4th lumbar. There is radiopacity and reduction of its height. There was an arrest of lipiodol at this level. Brucella agglutination was positive up to a dilution of 1:50, and to the Brucella skin test there was an intense positive reaction, +++ or more.

Fig. 7.
Case No. 4: Degeneration of disk between L III and L IV.

This patient was treated for chronic brucellosis. Surgical intervention was also effected, carrying out laminectomy and curettage of the herniated nucleus pulposus. We consider the fever of eight years before as the beginning of the brucellosis, the spondylitis and the hernia of the nucleus pulposus as direct consequences.

These findings are not uncommon; on the contrary, we must consider the hernia of the disk and of the nucleus pulposus as frequent in brucellosis with obvious radiologic spondylitis, as in the cases of Figs. 6 and 7, and even in those cases with less important lesions, as in the case of Figs. 1, and 2.

Di Rienzo[5] has presented cases of hernia intraspongiosa, of the type of Schmorl's node, and de Villafane[24,25] has also reported this alteration of the disk in brucellosis in papers previously published. But, with these exceptions and the paper by Profs. Drs. Ignacio Maldonado-Allende and Jose R. Aguirre,[12] up to date we do not know that hernia of the nucleus pulposus into the spinal canal has been given sufficient attention in relation to brucellosis by other medical or radiological authorities.

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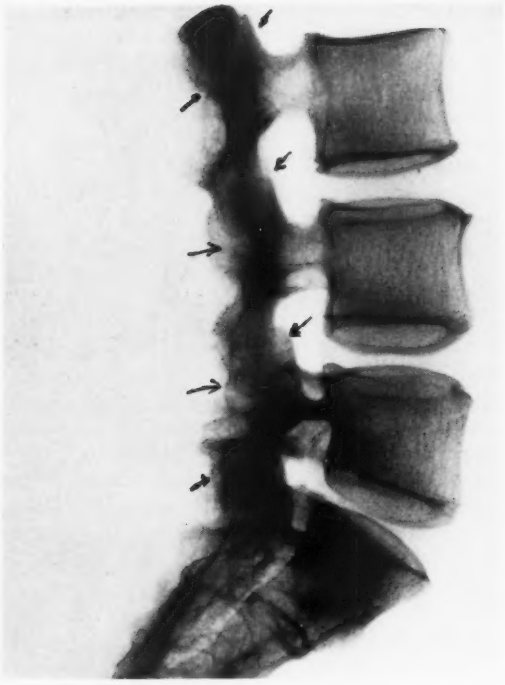

Fig. 8.
Case No. 2: Brucellar osteoarthritis of intervertebral joints; little obvious pathology shown by postmortem x-ray.

Without overlooking the frequency of the traumatic etiology of many hernias of the disk, and the other infectious etiologies of this disturbance, we wish to point out that brucellosis, acute or chronic, because of its attack upon the vertebral body and the disk, with clear alterations, may be directly involved in the pathogenesis of this disease. We also wish to emphasize that whenever there is a patient with medullary or radicular pains which may be attributed to the alteration of the intervertebral disk, it is imperative to find out whether brucellosis is involved, even in the presence of a traumatic accident. For, even if it is true that trauma by itself may be the immediate cause of the process, it is also true that in certain circumstances the trauma merely precipitates the final step in the process: the pre-existing Brucella infection being the true underlying cause because of the anatomical lesion it produces in the vertebrae and disk. It is our opinion that failure to appreciate the frequent relationship between brucellosis and herniated disk may account for many of the disappointing results of surgical treatment of this condition.

Ankylosing Spondylarthritis in Brucellosis

BRUCELLAR involvement of the intervertebral joints has been known for some time, but it has not been given sufficient attention. Physicians are generally not mindful of brucellosis when they find ankylotic vertebral arthritis. Eyre,[6] in 1908, reported that 58% of his cases of brucellosis involved the joints in general. Lemanski gave the figure between 30 and 40%, and for Cantoloube[3] it was 100%.

It was Catelli[4] who first studied the lesions of the intervertebral joints in brucellosis, considering them even more frequent than the lesion of the vertebral body.

These ankylotic arthritic or rather osteoarthritic lesions of the intervertebral joints are not rare in brucellosis. On the contrary, they are relatively frequent, alone, or, more often, associated with lesions of the body, disk, or of other bones or joints. Consequently, this infection should be borne in mind in the pathogenesis of these diseases because, even though they can be caused by various sepsis (syphilis, gonorrhea, sepsis of the tonsils and teeth, typhoid, pneumonia, etc.), brucellosis also plays an important role. In discussing the etiology of ankylosing spondyloarthritis (Strumpell-Pierre-Marie-Bechterew), Villaseca Sabater and Barcelo[26] stated that in only two cases of melitensis infection was there an evident relationship, so they doubted that brucellosis is an important factor. However, we believe, with certain other authorities[2,5,8,12,15,19] that Brucella infection is one of the frequent causes of this condition.

Fig. 8 shows an x-ray view of the lumbosacral region of the spine, taken after the death of the patient described in Case No. 2 of this paper. A minimal alteration of the anterior end of the body of the 4th lumbar can be seen, but more particularly there is a clearly condensing osteoarthritis in the neighboring intervertebral joints.

Fig. 9 shows the two halves of the sagittal section of this portion of the spine. In the vertebral bodies, there is no visible alteration, confirm-

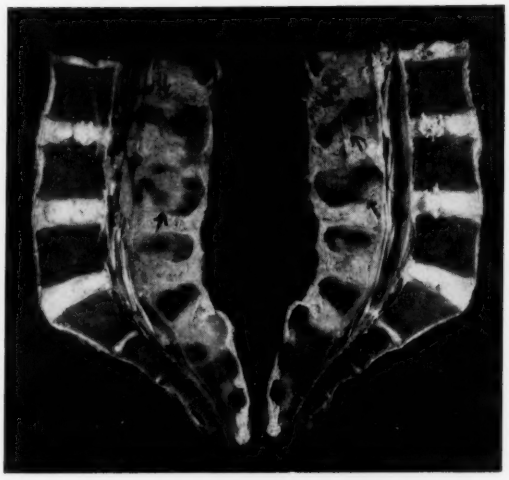

Fig. 9.
Case No. 2: Widespread involvement of posterior spine shown by actual photograph of autopsy section.

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ing the x-ray appearance. In the posterior portion, corresponding to arches, intervertebral joints and spinous processes, a marked infiltration of the bony parts can be seen, as was suggested by x-ray.

As can be noted from all these documents, this is a patient with severe lesions of the vertebral bodies and intervertebral disks of the 7th and 8th dorsal vertebrae (Fig. 5), with osteoarticular lesions at the level of the 11th thoracic and in the lumbosacral spine, as shown in Figs. 8 and 9. These x-rays and photographs of anatomic specimens confirm what we have said, that brucellosis attacks the vertebral bodies, but also it attacks frequently the disks, arches and corresponding joints or those of other vertebral groups.

CASE NO. 5 was that of J. R., 40 years old, a nurse. In 1939, a prolonged picture of fever appeared and there was a diagnosis of pleurisy on the left side. In 1944, after a smallpox vaccination, there appeared arthralgia, fever, loss of weight and persistent pain, predominantly in the lumbosacral region. A doctor was consulted in February, 1945, because of the patient's depression, loss of weight and lumbar pains. Laboratory findings showed a positive Brucella agglutination 1:100 and a positive Brucella skin test, resulting in a severe reaction generally and an exacerbation of her articular and spinal pains. Physical examination showed no disease in the thorax, a slightly enlarged spleen and liver, rigidity and pain in the lumbosacral region, a weakly positive Mantoux reaction. X-ray of the lumbar spine at that date showed normal vertebral bodies but condensed lesions of the arches and intervertebral joints.

Nine months later the opacity of this region had diminished. The articular line was absolutely effaced and in its place and in the neighboring bone parts rarified areas were seen. An oblique x-ray, taken at 45°, showed evident alteration and thickening of the articular facets. This patient has a pseudo-Pott's spondylitic lesion of the bodies of the 11th and 12th dorsals.

Villafane has studied and published[22,23,24,25] other cases with lesions similar to these, in which he has been able to prove the cause and effect relationship of the brucellosis. Some of these lesions are severe and even generalized, giving the complete clinical-radiological picture of the ankylotic spondyloarthritis, of the Marie-Strumpell type.

In one patient we have found a lesion of the lamina, described as follows:

CASE NO. 6: R. V., Argentine, 32 years old, laborer; had worked in the rural areas since the age of 17; onset of illness was in 1949. While making an effort to lift a pipe, the patient slipped and could not stand up because of pain in the sacroiliac area. Since that time there had always been pain in this joint, and for a year prior to entry, there was pain in the left leg, along the

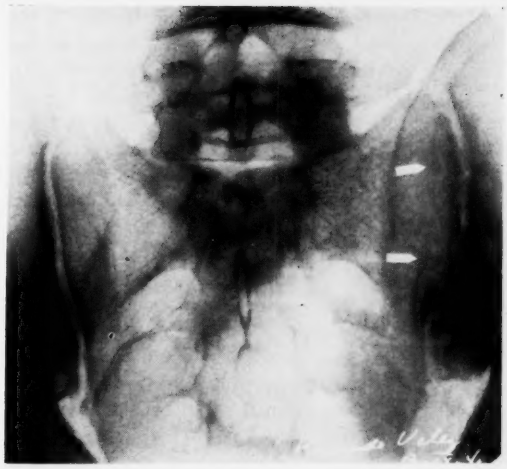

Fig. 10.
Case No. 6: Left sacroiliac arthritis in a case of brucellosis with degeneration of spinal lamina.

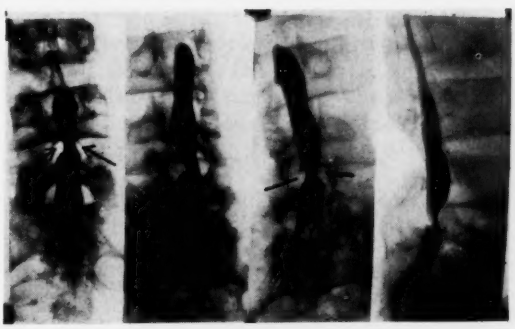

Fig. 11.
Case No. 6: Filling defect due to a lesion of the lamina in brucellosis.

sciatic nerve. Clinical examination showed evident symptoms and signs of affection of the left sciatic nerve. Past history showed no evidence of previous infectious diseases. Laboratory findings included a positive Brucella agglutination 1:25 to 1:50, opsonocytophagic index positive, intradermal test to Brucella: positive. Radiologic study showed a common osteoarthritic spur at the anterior superior margin of the 5th lumbar vertebrae, and in Fig. 10 can be seen the lesion of the left sacroiliac joint. The lipiodol study showed the hourglass image at the level of the disk between the 4th and 5th lumbar vertebrae, as seen in Fig. 11, where a filling defect appears in all at the same level. The patient was operated on with a diagnosis of radiculoneuritis of the sciatic nerve, and there was found a marked reduction of the foramen of the spinal canal, due to a lesion of the lamina. It was not possible to state that this lamina had been fractured.

It appears that in the above case, a diagnosis of chronic brucellosis was justified by the biological reactions, and that it may have been responsible for the spondylitis of the 5th lumbar of the "par-

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rot beak" type, and for the osteoarthritis of the sacroiliac joint, as well as for the lesion of the lamina. The initial trauma described in the history can be considered the starting point for the painful process of the sacroiliac joint, but not the underlying cause of the total picture.

Lesions of the spinous processes and transverse processes in brucellosis have been studied by the French school. For instance, Béchet, Puig and Charvet,[1] in their above-mentioned work, speaking of the abscesses of Brucella spondylitis, consider osteitis of the spinous and transverse processes as one of the causes for these abscesses. In the radiologic picture of these spondylitides, they point out the image localized in the spinous or transverse processes, and characterized, according to them, by small zones of rarified osteitis. We have had only one opportunity of studying a distinct lesion of the cervical spinous process.

CASE NO. 7: This patient suffered from acute brucellosis, with repeated positive blood cultures for Brucella. He was treated for nearly a year. There was a severe toxic infectious process, with repeated bouts of fever and a hematologic picture characterized by profound anemia, leukopenia and neutropenia. There was a spondylitic lesion in the 11th and 12th dorsal vertebrae. In the cervical region (Fig. 12) there was a spondylitic lesion of the bodies of the 4th and 5th cervical, and a fracture due to osteitis of the spinous process of the 7th cervical vertebra.

Fig. 12.
Case No. 7: Disk lesion of C IV and Brucella osteitis with separation of spinous process of C VIII.

Treatment

SURGICAL intervention into tissues harboring Brucella is likely to be disappointing, as it is in all of the chronic granulomatous infections. When operation is necessary for relief of pain and disability due to a herniated disk or spondylitis, it should be postponed until after the patient has been treated with combined antibiotics, desensitizing vaccine, and conservative medical management. During surgery and convalescence the patient should be protected by one of the tetracyclines and streptodihydrostreptomycin. Numerous postoperative complications, pseudoarthrosis, persistent pain and prolonged convalescence are invited when surgery is performed on patients with brucellosis who have been inadequately treated or allowed to remain excessively hypersensitized to Brucella.

The first objective of treatment is to destroy all accessible Brucella bacteria. This is done by giving 25 gm. of a tetracycline and 12 gm. of streptodihydrostreptomycin in three weeks. Adjunctive agents are often added to enhance the tolerability, effectiveness or penetration of the antibiotics. The more acute the disease is, the more effective is the combined antibiotic therapy.

The more chronic cases may respond well to antibiotics temporarily but they harbor entrenched, intracellular, inaccessible bacteria, and so tend to relapse unless they are also treated by desensitization with Brucella vaccine.[9,31,32] Large doses of vaccine may stimulate the body's resistive processes specifically or nonspecifically but this is an unpleasant procedure and it may even aggravate the disease in hypersensitized patients. Consequently doses of vaccine are best kept below the reaction level and very gradually increased by intramuscular or intravenous injection at two- to five-day intervals over a long period of time, until large doses of Brucella proteins and polysaccharides can be tolerated comfortably.

Summary

1. LESIONS of the intervertebral disk are frequent in brucellosis, causing hernia intraspongiosa, of the type of Schmorl's node, and/or herniation of the nucleus pulposus into the spinal canal.

2. In our studies, the attack upon the disk has always been associated with lesions of the neighboring vertebral bodies. Therefore, it may be presumed that the lesion spreads from the vertebral body to the disk, as shown by the anatomical specimens.

3. When the hernia of the disk is produced, and depending on its size and localization, neurological manifestations may appear, such as radiculoneuritis or meningomyelitis due to compression.

4. The small intervertebral joints are also frequently attacked in brucellosis, appearing as osteoarthritis. This lesion may appear, isolated,

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or limited to a small group of joints, especially in the lumbar area or associated with lesions of the vertebral bodies or of other bones.

5. We have also found lesions of the arches, and of the spinous processes, and of the ligaments and vertebral coverings, which may be attributed to brucellosis.

6. Patients with disk disease should be thoroughly tested for brucellosis prior to surgery, especially if there is an inadequate history of trauma and if the results of previous surgery have been disappointing, or if the patient has chronic ill health.

7. The salient points of the pathogenesis, diagnosis and modern treatment of brucellosis are reviewed.

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Fundamental Patterns

DESPITE vast clinical experience with psychosomatic illness, despite millions of hours devoted to the recall of childhood traumas, there still is no agreement on the role of childhood experience in the development of health or sickness in adults. Many cases of the so-called "maladaptive reactions" of adults — the chronic fatigue or neurasthenic syndromes, the organ neuroses such as peptic ulcer and colitis, the disabling hysterias, the anxiety disorders, and other psychophysiological ills — have been traced (to the satisfaction of most psychiatrists and clinical psychologists) to inappropriate patterns learned too rigidly in childhood. Wartime evidence indicated that even the strong personality has a breaking point under sufficient traumatic stress; psychological disorder in adults does not necessarily stem from childhood maladjustment. Though the evidence is mixed, the family of childhood undoubtedly affects adaptations to stress in adult life. Whether we habitually react to stress or frustration by withdrawal, aggression, escape in fantasy or functional illness is often a reflection or continuation of fundamental patterns acquired in early life.

—From "Public Health Begins in the Family," by HALBERT L. DUNN, M.D., and MORT GILBERT, in *Public Health Reports*, 71:10 (October) 1956, U.S. Public Health Service.

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Medical Aspects of Radiological Health

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INDUSTRY is deeply interested in radiological health primarily because radiation injures people. Ionizing radiation is silent, unseen, and unfelt. Its presence can be detected only by means of instruments.[1] Some of its damaging effects on human tissues may not develop until many years after exposure. Chronic radiation injuries are cumulative and gradual; therefore, radiation hazards cannot be treated like other common ones.

The mechanism by which radiation produces its damage on the living cell is not fully known. However, we do know much about the effects of ionizing radiation on living cells. These effects can be produced by any one of the various types of ionizing radiation, although often there is a difference in dosage between the several forms that will produce similar changes. There is no idiosyncrasy to any of the forms of ionizing radiation, so there is no need to fear that small doses, harmless to most, will injure a few, except that small doses in a few individuals apparently act as a trigger mechanism in the production of leukemia.

There is a latent period between exposure and the manifestation of damage produced. The larger the dose the earlier the appearance of injury. However, injury from repeated small doses may take 25 years or more to manifest itself.

The lethal radiation dose is of quite narrow range, yet tissue cells differ greatly in their radiosensitivity; younger, rapidly-dividing cells, such as exist in the blood-forming tissues and gonads, being the most sensitive while fully differentiated nerve and muscle cells are the most resistant.

The specific effects produced in the body by irradiation depend upon the distribution of the radiation within the body, i.e., the dosage received by the different organs and tissues. The summation of the individual organ damages determines the total body injury suffered.

The critical body tissues are the blood-forming organs, gonads, and lens of the eye. The tolerance dose—or permissible dose, which is a better term —is defined as that dose of ionizing radiation that, in light of present knowledge, is not expected to cause appreciable bodily injury to a person at any time during his lifetime. The permissible weekly dose is that dose of ionizing radiation accumulated in one week, of such magnitude that in light of present knowledge is not expected to cause appreciable bodily injury to a person at any time during his lifetime.

Examples: 600 mr is the permissible weekly dose to the whole body exposed to x-rays, while 1500 mr if only the hands are exposed. The gonads, blood-forming organs, and the lens of the eye are composed of highly susceptible tissues; so 300 mr is the permissive weekly dose to these organs. The skin, on the other hand, is less sensitive and 600 mr is its permissive weekly dose. Actually there is no factual human experience basis for these dosage levels. They are the result of calculations based on animal experimental work and acute human exposures.

Modifying Circumstances

1. AGE: The gonads cease to be critical organs at age 45 — the common upper limit of reproduction for both sexes — so we can double the permissible weekly doses to the gonads over age 45 quite safely.

2. TIME: For short periods of time the permissive weekly dose can be exceeded in exceptional cases. Dosage as much as 10 times the permissive weekly dose can be allowed for a period as long as two-and-a-half weeks, if the next 10 weeks there is no exposure. Also the permissive weekly dose can be exceeded by two or three times for even longer periods providing the total dose accumulated in 13 weeks does not exceed 10 times the permissive weekly dose.

3. PREGNANCY: The developing embryo is most sensitive during the first three months, but it is not necessary to go below the weekly permissive dose. However, it is unsafe to exceed this limit even for short periods.

4. CHILDREN: Developing children are most sensitive and should receive no more than one-tenth the permissive weekly dose.

Total Radiation Exposure

GOOD human data on chronic exposure are scanty, although perhaps in the future substantial data can be secured from examining certain human groups who have received radiation via: (1) Industrial exposures. (2) Deliberate exposures for benign conditions. (3) Individuals administered isotopes.

Presented in part at the Ninth Health Conference for Business and Industry in Houston, Friday, September 21, 1956.

In order accurately to assay the total dose of any individual or group, the total of (1) the external dose, (2) the ingested dose, and (3) the inhaled dose, must be ascertained. The damage suffered frequently manifests itself clinically in three forms: genetic effects, cancer and leukemia, and shortening of life span. Each of these entities will be discussed briefly.

Genetic Effects

IONIZING radiations are capable of producing changes in the individual genes and chromosomes in nucleated cells. The subsequent manifestations are generally deleterious to the individual, and to future generations when they occur in germ cells. Perhaps this situation is best portrayed by a few pertinent quotations from a recent report of the National Research Council:

"It is also estimated that a dose of 10 roentgens to every person in the United States would cause something on the order of five million mutant genes which would then be a part of the population's inheritance pool. This figure is subject to considerable uncertainty."[2]

"Thus, for the general population, and in the long run, a little radiation to a lot of people is as harmful as a lot of radiation to a few, since the total number of mutant genes can be the same in the two cases."[2]

"It is difficult to arrive at a figure showing how much genetic harm radiation can do. One measure is the amount of radiation, above the natural background, which would produce as many mutations again as occur spontaneously. It is estimated that this amount is 30 to 80 roentgens."[2]

Cancer and Leukemia

VARIOUS types of cancer, particularly of the lung and skin, may arise from excessive amounts of radiation. Leukemia also is a frequent result of over-radiation. Significantly higher rates of leukemia among radiologists have been reported.[3] Formerly, cancer and leukemia were believed to come only from chronic exposures but now they are occurring among individuals from the acute exposure in Hiroshima.[1] Two quotations from another recent National Research Council publication are most helpful in this connection:

"Local radiation in sufficient amount to almost any part of the body may produce cancer, the chance of tumor development being somewhat related to dose. Since the cancer cell is an altered type of a normal tissue cell, it has often been suggested that cancer is a somatic mutation, like a genetic mutation, but arising in a tissue cell which perpetuates the character by its growth."[4]

"All types of induced and spontaneous tumors appear not to arise at once, but to pass through a series of preliminary stages; and radiation-induced tumors take a particularly long time to develop."[4]

Shortening of Life Span

EXPOSURE to radiation in sufficient amounts significantly shortens the average life span. In experimental animals (mice and rats), appreciable shortening of life span occurs with 0.1 roentgen daily. As yet, no quantitative information is available in case of man. However, apparently it is not the last few numerical years that are lost; rather this loss of years appears to take place about the time in life of these exposures. The National Research Council report expresses it this way:

"Irradiated individuals may age faster than normally even it they do not develop specific radiation-induced diseases like leukemia. It has not been shown that exposures small enough to be genetically tolerable have this effect. Furthermore, the permissible exposure levels that have been established for persons working with radiation appear to be within the limits of safety. However, it is not yet known what minimum dose, if any, would be necessary to produce a statistically noticeable reduction of life span when very large numbers of people are concerned."[5]

Conclusion

MEDICAL uses of radiation should be subjected to the same control as industrial or research uses. Although at times large amounts of radiation are justified (for serious or fatal diseases), the potential exists today for damage to other individuals because of the cumulative effects and incomplete tissue repair. In this situation, the total exposure of these individuals must be kept below the point where damage will become manifest during their individual expected lifetimes. In the past, there has been too liberal a use of x-ray in medical and dental diagnostic work. This does not mean that valuable x-ray chest surveys should be discontinued; rather that discretion be used in repeating medical diagnostic x-rays.

Physicians in industry having employees exposed to any type of ionizing radiation from x-ray to radioactive isotopes should keep accurate records on all employees as to total accumulated exposure. Such records are apt to become exceedingly valuable to the company, the individual, and for research on cumulative long-range effects of small amounts of ionizing radiation.

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The Responsibilities of the Medical Profession in the Use of X-Rays and Other Ionizing Radiation

A Statement by the
UNITED NATIONS SCIENTIFIC COMMITTEE ON THE
EFFECTS OF ATOMIC RADIATION

THE UNITED NATIONS General Assembly, being aware of the problems in public health that are created by the developments of atomic energy, established a Scientific Committee on the Effects of Atomic Radiation. This Committee has considered that one of its most urgent tasks was to collect as much information as possible on the amount of radiation to which man is exposed today, and on the effects of this radiation. Since it has become evident that radiation due to diagnostic radiology and to radiotherapy constitutes a substantial proportion of the total radiation received by the human race, the Committee considers it desirable to draw attention to information that has been obtained on this subject.

Modern medicine has contributed to the control of many diseases and has substantially prolonged the span of human life. These results have depended in part on the use of radiation in the detection, diagnosis, and treatment of disease. There are, however, few examples of scientific progress that are not attended by some disadvantages, however slight. It is desirable, therefore, to review objectively the possible present or future consequences of increased irradiation of populations which result from these medical applications of radiation.

General Survey of the Irradiation of Human Beings

MAN has always been exposed to some irradiation from natural sources. To this has now been added, as a result of modern discoveries and the applications of ionizing radiation and radioactivity, certain forms of artificial irradiation.

Natural irradiation is due to:

1. Cosmic radiation;
2. "Background" gamma radiation from radioactive substances present locally in the earth, rock, or building materials, and from disintegration products of radon in air;
3. Radiations emitted from natural radioelements such as potassium 40, radium, radon and carbon 14 which are incorporated in the body.

The amount of this natural radiation varies with locality, but has been estimated as usually delivering between 70 and 170 mrems per year to the gonads. Of this total, the major contributions are of about 45% from local gamma radiations, 30% from cosmic rays and 20% from body potassium 40.[1]

Artificial irradiation is derived from:

1. The contamination of the environment, the atmosphere, or water by radioactive waste from atomic industries or from users of radioelements;
2. The radioactive fallout, at greater or lesser distances from the source, or radioactivity resulting from the explosion of nuclear devices;
3. The occupational exposure of certain groups of workers: medical practitioners, radiologists, dentists, nurses, atomic energy workers, uranium or thorium miners, and the industrial or scientific users of radiation generators or radioactive isotopes;
4. The medical use of x-rays, other ionizing radiations and radioelements in the detection, diagnosis, investigation and treatment of human diseases;
5. The use of certain devices which emit radiation, such as television receivers, watches with luminous dials, and the x-ray generators used for the purpose of fitting shoes.

The amount of artificial radiation must vary considerably in different countries and we have inadequate information as to the over-all significance of these factors. In certain countries where estimates have been made, it appears that the greatest gonad irradiation of the population is due to diagnostic radiological procedures, the amount from this source about equalling that from all natural sources in certain instances. The total present contribution from occupational exposure, from the products of atomic industries from radiotherapy and from the radiating devices mentioned above is likely to be very considerably smaller. That from radioactive fallout to the gonads appears at present to be in the region of

1% of the natural gonad irradiation in most areas.[2]

Both the magnitude and the significance of these various sources are under review by the Committee. Since medical irradiation accounts for a substantial if not the major proportion of all artificial exposure, it is important that its magnitude should be known accurately for different countries and circumstances. The possibility of making such an assessment depends upon the help of the medical profession, and particularly on the adequacy and availability of records kept by doctors, dentists, and organizations responsible for the use of ionizing radiation.

Radiation Hazards

THE MEDICAL use of radiation is clearly of the utmost value in the prevention, diagnosis, investigation, and treatment of human disease, but the possible effects of this irradiation of individuals require examination.

Generally speaking, the irradiation of living beings may produce radiobiological effects either on the irradiated individual himself or, through him, on his descendants; the former being termed somatic and the latter genetic effects. Somatic effects vary according to the different organs or tissues affected, and range from slight and reversible disturbances such as cutaneous erythema to the induction of leukemia or of other malignant diseases. The possible reversibility of the somatic effects of radiation received in small doses or at low dose rates encourages the belief that there are permissible doses of radiation which will not cause completely irreversible or significant somatic damage. The threshold for occasional somatic damage may, however, prove to be low. In the case of genetic effects, on the other hand, there may be no threshold. These effects increase with a frequency corresponding to the total amount of radiation received by the germinal tissues, and in the great majority of cases, are adverse.

Many other factors complicate the interpretation of radiobiological effects. The differences between whole and partial body radiation, between a single exposure and continuous irradiation, or between the effects of different types of radiation are still imperfectly understood. Biological differences in the radiosensitivity of various tissues, or of the tissues of people of different age or sex, obviously influence the nature of radiation hazards. It is clear, however, that any radiation of gonads, and any substantial irradiation of other tissues, involves a chance of significant damage which requires assessment.

General Recommendations

THE RADIOLOGICAL profession, through the International Commission on Radiological Protection,[3] has undertaken a valuable and responsible duty in defining maximum permissible limits of exposure for the main radiation hazards.

The establishment of these maximum permissible levels for those who are occupationally exposed to radiation depends on the view that there are doses which, in the light of our present knowledge, do not cause detectable somatic injury in the individual irradiated; and on the consideration that the number of individuals concerned is small enough for the genetic effects on the whole population to be negligible. For the gonads, or for irradiation of the whole body, the levels are such as to exclude doses greater than 0.3 rem in any week or 3.0 rem in any 13 weeks, or a sustained irradiation rate greater than 5 rem per year. These values imply that no total dose of over 50 rem will have been received by the gonads by the age of 30, or of over 200 rem by the whole body by the age of 60, in any occupationally exposed person.[3]

As regards irradiation of the whole population, it is considered prudent to limit the average dose to germinal tissues from artificial sources to the order of magnitude of that received from all natural sources.

In considering the extent to which the population is irradiated for medical purposes, it is essentially the genetic hazard which is involved although it seems possible that in certain circumstances somatic injury may occur occasionally after low doses of radiation arise. Otherwise, the relevant dose is that indicating the mean gonad irradiation among the population as a whole up to the end of the average reproductive period.

The extent of such genetic irradiation from diagnostic procedures has been found to be equal to at least 100% of all natural radiation in two countries,[4] and that from a third equalled at least 22% of this figure.[5] Even before obtaining more exact values for these and other countries, it is clear that the exposure can be substantial in countries with extensive medical facilities, and that it is essential to consider any ways in which this exposure could be reduced without detriment to the existing or developing value of medical radiology.

The Committee is therefore anxious to obtain the help of radiologists in suggesting through appropriate governmental channels any methods by which this total exposure could be reduced and in estimating the amount of reduction that might be expected from any such methods. In particular it would be valuable to know how much the radiation to the gonads could be reduced:

(a) by improved design or shielding of equipment;

(b) by fuller training of any individuals using radiographic or fluoroscopic equipment;

(c) by any local shielding of the gonads that is practicable, especially during abdominal or pelvic examination;

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(d) by the use of techniques involving radiography rather than fluoroscopy when full information can be obtained by this means;

(e) by improvement of administrative arrangements designed to obviate unnecessary repetition of identical examinations of the same subject;

(f) by a general study of certain medical conditions such as that of peptic ulcers, to identify the circumstances in which the establishment of a radiological diagnosis has or has not a definite influence upon the treatment or prognosis given.

Summary

1. THE SCIENTIFIC Committee on the Effects of Atomic Radiation established by the United Nations General Assembly accepts the view that the irradiation of human beings, and especially of their germinal tissue, has certain undesirable effects.

2. Information received so far indicates that, in certain countries (Sweden, United Kingdom, United States of America), by far the most important artificial source of such irradiation is the use of radiological methods of diagnosis and that this may be equal in importance to radiation from all natural sources. It is possible that such radiation may be having a significant genetic effect on the population as a whole.

3. The Committee is fully aware of the importance and value of the medical use of radiations but wishes to draw the attention of the medical profession to these facts and to the need for a more accurate estimate of the amount of exposure from this source. The help of the medical profession would be most valuable to make it possible to obtain fuller information on this subject.

4. The Committee would be particularly grateful for information through appropriate governmental channels on ways in which the medical irradiation of the population can be reduced without diminishing the true value of radiology in diagnosis or treatment.

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1. From reports sent by India, Sweden, the United Kingdom and the United States of America.
2. According to the reports sent by the United Kingdom and the United States of America.
3. See the report of the International Commission on Radiological Protection, published in the *British Journal of Radiology*, Supplement 6, December, 1954, in the *Journal Francais d'electroradiologie*, No. 10, October, 1955, etc.
4. Sweden, United States of America.
5. United Kingdom.

"Our Enemy, the State"

ONE of the greatest dangers in a democracy, says Mill, is the stifling of individuality. When the majority dictates, uniformity and conformity become the rule. And from such oppression there is no escape. It is social as well as political. Whoever dares to break the pattern of behavior is regarded as queer. Eccentricity in thought, or speech, or action is viewed in the same light as "some grave moral delinquency." In such an atmosphere greatness cannot develop, genius cannot live. And it is to those who dare to be different, who insist on developing their own genius in their own way, that society must look for its advancement. Thus democracy becomes a hostile soil for its most essential plant—genius. According to Mill, we must constantly be on our guard against our enemy, the state. Everywhere power tends to become centralized; bureaucracies multiply; and soon the government has a thumb in every pot. This is unfortunate, because the individual generally does a thing better than the government can do it. And, even if the government were more efficient, the individual, for the development of his own personality, should be given preference. In the past century history has not gone with Mill. In one-half the world today, the totalitarian half, the state is all, the individual is nothing. In much of the rest of the world the welfare state has taken over. Mill's is an alien voice. All the more reason, therefore, that we should heed it. In English literature his is the most eloquent plea for individuality. He tries to rescue his countrymen from the mediocrity of the majority and dictatorship of the dull. He is so stout a champion of liberty that he insists even on our "right to be wrong."

—From the Essay by FREDERIC E. FAVERTY, entitled "John Stuart Mill: Champion of Liberty," 13th in a Series on "Our Literary Heritage," by DR. FAVERTY, in *Chicago Sunday Tribune Magazine of Books*, January 6, 1957.

Carcinogenicity of Atmospheric Pollutants

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DURING the last two decades primary carcinoma of the lungs has been recognized as one of the most common forms of cancer in man. Because the lung is a respiratory organ, considerable attention has been devoted to study of potential carcinogens in the atmosphere which may contribute to the increase in the incidence of this disease. Whether this increase in lung cancer is the result of increase of air pollution by the rapid growth of industry, of increase in use of automobiles, or of increased use of cigarettes during the last 30 years cannot be definitely decided from the experimental data gathered. Indeed, there are some scientists who claim that the apparent increased incidence of lung cancer is due to development of better diagnostic methods for detection. The purpose of this research was to determine whether tumor inducers exist in several common sources of atmospheric pollution.

Passey *et al*[1,2] have reported that ether extracts of bituminous coal soot painted on mice induced skin tumors. Campbell[3,4] reported that dust from tarred roads increased lung cancer incidence in mice, but he was unable to induce any cancer with exhaust gases from internal combustion engines or with tobacco smoke. Leiter, Shimkin, Shear[5] have produced subcutaneous sarcoma in mice with tars extracted from atmospheric dust of several industrial cities. Numerous investigators have reported on carcinogenic hydrocarbons, and recently Cooper[6] found and identified 3:4 benzpyrene, a strong carcinogenic compound, in the atmosphere at Salford, England. Kotin[7,8,9] and his co-workers at the University of Southern California have demonstrated the existence of carcinogens in the Los Angeles atmosphere and have extracted carcinogenic hydrocarbons from gasoline and diesel engine exhausts.

Method of Extraction

AT THE beginning of this research program, 4% extracts of oil and coal burner soots and of diesel and gasoline engine exhausts in benzene were made to evaluate these sources as to the relative amount, if any, of tumor-inducing substances present. Difficulty was encountered with the diesel engine exhaust condensate in that the concentration of benzene-soluble material was so very low. Because of the expense involved, an extract less concentrated than 4% was used. A single-cylinder unit in the lubricant testing laboratory provided the diesel exhaust source. A six-cylinder Chevrolet motor and a single-cylinder unit used for testing gasoline additives provided the gasoline engine exhaust from which the benzene-soluble material was extracted.

The apparatus used to collect and condense the gasoline engine and diesel exhaust is shown in Fig. 1. The exhaust gases were led through a four-foot length of quarter-inch ID copper tube with a water-cooled jacket to a trap. A thermometer at the trap was used as a check on keeping the temperatures of the incoming gases at a safe level. The effluent was then pulled through a 15-inch jacket length, helical condenser, and the concentrate was allowed to drip into a collecting bottle. As a safeguard against damaging the pumps, the effluent was further dried by passing it through a glass coil immersed in an ice bath. To insure against accidental entry of water into the pumps in case of leakage through the coils, a large receptacle was placed in the line to the pumps. The total volume of exhaust gases required to obtain five and one-fourth gallons of exhaust condensate from both gasoline and diesel

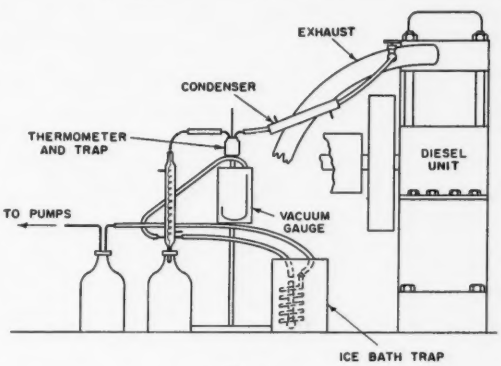

Fig. 1.
Diesel and gasoline engine exhaust condensate equipment.

TABLE I.
VOLUME OF GASOLINE EXHAUST FROM WHICH 5¼ GALLONS OF CONDENSATE WERE OBTAINED AT APPROXIMATELY 60°F

Set-up No.	No. of Pumps	Vacuum, in.	Operation, hr.	Gasoline Exhaust			
				Production Rate			Total
				l./min	ft³/min	ft³/hr	ft³
1	1	0.8*	1.7	15.7	0.56	34	57
2	1	1.0*	1.4	18.2	0.64	38	53
3	2	4.2	5.9	41.0	1.45	87	515
4	3	6.1	5.5	49.4	1.74	104	567
5	3	6.0	53.5	48.9	1.73	104	5560
6	0	**	45.5		0.10***	6	273
Total			113.43****				7025

*Approximate values.
**⅛-in. flow.
***Obtained by using wet meter.
****199 Pump hours.

TABLE II.
VOLUME OF DIESEL EXHAUST FROM WHICH 5¼ GALLONS OF CONDENSATE WERE OBTAINED AT APPROXIMATELY 60°F

Set-up No.	No. of Pumps	Vacuum, in.	Operation, hr.	l./min	ft³/min	ft³/hr	Total ft³
1	2	4.8	35.3	55.9	1.98	119	4,200
2	3	5.84	95.5	61.6	2.17	130	12,415
Total			130.80*				16,615

*357 Pump hours.

engines for the first samples is shown in Tables I and II.

The data were obtained by using a rotometer to convert inches of vacuum to milliliters per minute from which, by the application of the standard gas laws, it was possible to calculate total cubic feet corrected to 770-mm pressure.

These calculations point up certain fundamental differences in diesel and gasoline engines. It is probably true that the five and one-quarter gallon condensate would have been collected in approximately 131 hours whether the exhaust effluent was produced by a one-cylinder, as in this case, or by a six-cylinder diesel engine. This would seem to be true since the 2.17 ft³/min capacity of the pumps used only a small percentage of the capacity of the diesel unit to produce exhaust effluent. On this premise, the data obtained indicate that the pollution of the atmosphere by benzene-solubles from the operation of a gasoline engine is almost eight times greater than it is from the operation of a diesel engine. This follows, since to collect the five and one-quarter gallon condensate, it was necessary to pass 16,615 ft³ diesel exhaust compared with only 7,025 ft³ gasoline engine exhaust, a ratio of 2.4:1. Apparently, a difference in air:fuel ratios is responsible for this phenomenon. But the ratio of benzene-soluble material in the gasoline condensate to that in the diesel condensate is 3.3:1. The atmospheric pollution with respect to benzene-soluble materials per unit of operating time, based on the assumption of identical displacement for both engines, is approximately 2.4 x 3.3, or 7.9, times higher in the gasoline exhaust than it is in the diesel exhaust.

The oil and coal soot solutions were prepared by extracting these substances with benzene in a Soxhlet reflux apparatus. The extract of coal soot was prepared from a sample obtained at the Illinois Central Round House located on East 27th Street at the IC tracks, while the oil soot used came from a variety of sources. For Solution 1 these were: 3410 North Lake Shore Drive Building, Chicago Memorial Hospital, Farr Hall, the Sherry Hotel, the Del Prado Hotel, and the Standard Oil Building. The latter was the principal source of benzene-soluble material. For oil soot Solution 2, samples from the Standard Oil Building, the Pure Oil Building, and Lake Meadows were used. Soots from the latter two sources were the richest in benzene solubles of all the samples tried. The quantities of the two kinds of soot used in preparing the three solutions submitted are as follows:

	Weight, g	
	Solution 1	Solution 2
Coal Soot	3,200	—
Oil Soot	13,100	18,600

The volumes and concentrations for the benzene extracts obtained were:

Group	Agent	Solution 1		Solution 2	
		Vol, ml	Conc, %	Vol, ml	Conc, %
A	Diesel Condensate	105	2.3	100	0.5
B	Gasoline Condensate	200	4.0	116	4.0
C	Oil Soot	117	4.0	172	4.0
D	Coal Soot	558	4.0	—	—

Method of Application

SINCE the usual laboratory mice have a large genetic difference and the possibility exists that some mice are more resistant to a carcinogen than others, it was essential that all the mice be identical as if they were all from the same litter or, better, were identical twins. Colonies of mice which have been inbred sister and brother for a number of years for the specific purpose of producing identical mice for testing of potential carcinogens were obtained from Roscoe B. Jackson Memorial Laboratory, Bar Harbor, Maine. The LAF_1 hybrid was selected because such animals are sturdy as a result of hybrid vigor. The male of the cross is A/He strain, and the female is of the Leaden strain. From the available information, it appears that these mice may be sensitive to carcinogens, and all the mice are genetically similar.

The LAF_1 mice were divided into five groups of 36 animals each. Group A were treated with benzene and considered the control group. Group B were painted with 2.26% diesel exhaust extract; Group C, with 4% gasoline engine exhaust extract; Group D with 4% coal burner soot extract; and Group E, with 4% oil burner soot ex-

TABLE III.
FIRST APPEARANCE OF CANCER IN LAF_1 MICE AFTER SEMIWEEKLY APPLICATIONS OF 1% BENZO (a) PYRENE IN BENZENE

Animal No.	After First Application, days	Animal No.	After First Application, days
F2-6	37	F1-6	86
F2-7	40	F2-3	86
F1-1	79	F1-3	93
F1-5	79	F2-4	93
F1-7	79	F2-5	114
F1-2	86		

tract. After two months, 11 of the controls were started on a treatment program with 1% benzo(a) pyrene (Group F). The hair was carefully cut on the interscapular area, and each animal was swabbed semiweekly with 0.025 ml of the appropriate extract. The animals were watched for signs of skin irritation, cancer, or tumor.

Skin Cancer Induced by Benzo(a) Pyrene

GROUP F, 11 of the control animals from Group A, were treated with a 1% extract of a well-known carcinogen, benzo(a) pyrene, in order to obtain comparisons between skin cancers induced by the benzo(a) pyrene and any tumors formed from the atmospheric pollutants. All but one animal treated developed cancer after three months, and all the animals were dead within seven months apparently because of the induced growths. The data resulting from the application are presented in Table III, while Fig. 2 shows a mouse with a skin cancer induced by benzo(a) pyrene.

Results of Extracts of Atmospheric Pollutants

THE VARIOUS extracts and benzene controls were applied twice a week to 167 mice for 11 months. At the end of this period a high percentage (76%) of induced tumors was observed in the group of mice painted with the extract of the gasoline engine exhaust. Only one tumor was induced in the group of mice treated with the coal soot extract and none in the groups in which benzene, oil soot extract, and diesel exhaust extract were used. The data are presented in Table IV. Fig. 3 shows a typical skin tumor produced by the gasoline engine exhaust.

Six of the tumors examined microscopically were of the pedunculated papillomata type with the characteristic long narrow stalks (Fig. 4) of dense fibrous tissues with numerous blood vessels. In a few of these tumors the epithelium had broken through the basement membrane and invasion was beginning. A cross section of normal skin is presented in Fig. 5 for comparison.

It has not been investigated in the course of this project whether the larger percentage (40%) of deaths of the mice treated with oil soot is significant. However, it should be investigated further with more animals both in the control group and in the oil soot extract group.

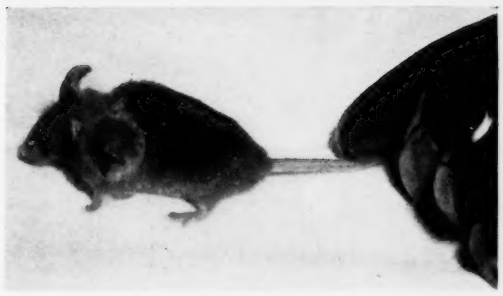

Fig. 2.
Skin cancer in mouse induced by twice-a-week application to skin with 1% benzo (a) pyrene.

Fig. 3.
Skin tumors in mouse induced by twice-a-week topical application of 4% benzene-soluble material from gasoline engine exhaust.

TABLE IV.
COMPARISON OF TUMORS PRODUCED IN MICE BY EXTRACTS OF ATMOSPHERIC POLLUTANTS
(11-month treatment)

Agent	Conc. %*	No. of Animals			
		Total	Died**	Survivors	
				Total	Developed Tumors
Benzene (control)		24	2	22	0
Diesel Exhaust	2.26***	36	7	29	0
Gasoline Engine Exhaust	4.00	36	7	29	22
Coal Soot	4.00	36	5	31	1
Oil Soot	4.00	35	14	21	0

*In benzene.
**Of unknown causes apparently not related to treatment.
***During last six months of treatment, concentration was 0.5%.

TABLE V.
FIRST APPEARANCE OF TUMORS IN LAF_1 MICE AFTER SEMIWEEKLY APPLICATIONS OF 4% EXTRACTS OF GASOLINE ENGINE EXHAUST IN BENZENE

Animal No.	After First Application, days	Animal No.	After First Application, days
C1-4	241	C2-7	303
C1-7	241	C5-1	303
C5-2	246	C6-8	303
C3-2	266	C1-2	308
C3-3	266	C2-2	308
C3-4	269	C4-4	315
C3-6	284	C5-5	315
C5-6	287	C1-5	340
C4-1	287	C5-3	340
C1-1	303	C6-2	340
C2-4	303	C6-6	340

XUM

Fig. 4.
Cross section of a tumor in mouse induced by gasoline engine exhaust.

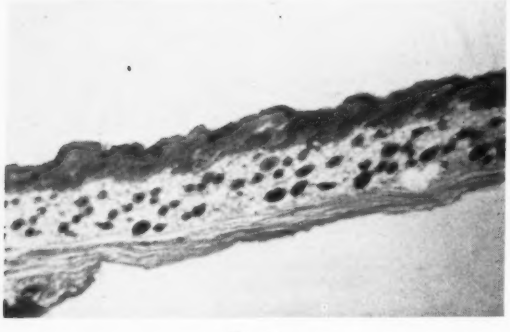

Fig. 5.
Cross section of normal skin tissue of mouse.

Discussion of Data Obtained

THERE is indeed strong evidence (Table V) that the gasoline engine exhaust extract has a marked tumor-inducing effect upon the skin of LAF_1 mice. The gasoline engine exhaust was calculated to be 28.8 ft^3/min at idling speed (500 rpm) and 86.4 ft^3/min at 30 mph (1500 rpm). Since 7,025 ft^3 of exhaust yielded 200 ml extract (8,000 drops of 0.025 ml each), 0.025 ml extract was equivalent to 0.88 ft^3 exhaust. The majority of tumors appeared at the fortieth week, which means a tumor was induced in an animal by 80 treatments of 0.025 ml extract, equivalent to the exhaust of an engine idling for two and a half minutes or running three-fourths of a minute at 1500 rpm. Whether the tumor inducers, if present in the other extracts, were too dilute because the air pollutants had a low concentration to start or whether the method of extraction favorably concentrated the carcinogens from the gasoline exhaust needs to be examined.

It is possible that in combustion of the oil burner fuel and of the coal most of the tumor inducers might have been in the gaseous portion that escaped by the chimney, so that the respective soots were very low in tumor-inducer content. The efficiency of the combustion may be important, and, also, the engine load may affect the tumor-inducing tendency of the exhaust. Kotin, Falk, and Thomas[9] reported that load and engine speed increase the amount of aromatic polycyclic hydrocarbons in diesel engine exhaust, while load and engine speed decrease these hydrocarbons in automobile engine exhaust.

There is much to be done in the field of atmospheric pollution by carcinogens. The important point at this stage is to define the exact chemical nature of the carcinogenic or tumor-inducing compounds which either are present in the atmosphere or might be introduced into the air in large quantities. Therefore, the various sources of air pollutants should be tested under a controlled variety of conditions, and exhausts or chimney gases examined to determine whether they contribute the offending tumor inducers. Research work needs to be done on actual sampling of air in various localities and then attempting to relate the concentration of the tumor-inducing compounds with the meteorological and topographical conditions and sources of the pollution. Then appropriate measures could be taken to control the combustion to produce a minimum of such pollutants.

[Acknowledgements are made to LEONARD PHILLIPS, MYRON HILLMER, and BETTY BURKHARDT for their aid in the laboratory work, and to the members of the Engine Laboratory. This study was made possible by a grant from the Foundation Sponsored Research Committee of Armour Research Foundation of Illinois Institute of Technology.]

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Tuberculosis—In and Out of Industry

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THESE are changing times in tuberculosis. Death rates have fallen sharply and there has been a small but steady decline in incidence rates. New drugs and resection surgery have had so profound an effect that there is danger of overoptimism. Tuberculosis is far from eradicated.

The Problem

THERE are an estimated 1,200,000 people with tuberculosis at present living within the continental United States; 400,000 have active disease, 150,000 of whom have not been diagnosed. At present, 800,000 are inactive, but 80,000 will relapse and again become active. This year, one person in 100 will become infected, and two persons in 1,000 will develop tuberculosis. In 1955, of 100,000 new patients, 75,000 had active disease. There were 15,000 people who died with tuberculosis. During this same year an increase in the number of new cases was reported by 15 states and the District of Columbia — and the District of Columbia and 11 states reported an increase in the number of deaths.

In the New England States there are an estimated 45,000 people with tuberculosis, of whom 15,000 have active disease, and 5,000 of these are undiagnosed. There are 30,000 who are at present inactive, 3,000 of whom will relapse. In 1955 of 3,800 new patients, 3,300 had active disease. There were 775 people who died with tuberculosis.

Management

HOW ABOUT the old familiar landmarks in the management of tuberculosis — hospitalization, absolute bed rest, collapse therapy, sputum studies, x-rays, symptoms, exercise, work tolerance, rehabilitation and follow-up?

We believe that active tuberculosis is best managed in the hospital. Absolute bed rest has been modified and is being evaluated under the protective umbrella of drug therapy. We are learning to use the new methods and evaluate the old, retaining whatever of the old that is good and replacing only when we have something better.

Drug therapy, blood banks and advances in anesthesiology have contributed to the development of resection surgery. Wedge and segmental resections, lobectomy and pneumonectomy offer the advantage of removal of tuberculous tissue and have largely replaced collapse therapy measures, although pneumothorax and pneumoperitoneum are occasionally used, and plombage and thoracoplasty have a limited place in today's surgical procedures.

Drug therapy has cut down on the amount of sputum. In most patients conversion from positive to negative sputum occurs in three or four months. Sputum usually remains negative while the patients are on drugs but may revert to positive when drugs are discontinued. A series of negative sputum examinations on smear, culture and animal inoculation is of less prognostic significance if the patient is on drug therapy than it is after the drugs have been discontinued for three or more months. Today we find tubercle baccilli on smear that do not grow on culture, we find tubercle baccilli that grow on culture but do not produce tuberculosis in the laboratory animal. We find tubercle baccilli that are resistant to one or more of the antituberculous drugs. Sensitivity studies on positive cultures, guide changes in chemotherapy. Proper significance must be placed on "nonvirulent" and "nonpathogenic" acid fast organisms. Sputum examinations and the significance of sputum findings have indeed become complex.

Conventional x-ray examination, aided by body section laminagraphy, helps to determine stability. We still find bacteriological relapse with an unchanged x-ray picture, but today we also have the question of the "sterile cavity" and the controversy of "bleb versus cavity." Suffice it to say, cavity or bleb, sterile or nonsterile cavity — we prefer surgical removal when possible.

A feeling of well-being early in the course of recovery is the rule more so today than in the past. Graduated exercise, work tolerance and rehabilitation, like bed rest, are being modified and evaluated. Follow-up after discharge is important for the protection of the patient and for the proper evaluation of today's changing picture of treatment and management.

As for chemotherapy, we are still searching for the nontoxic, inexpensive bactericidal oral drug while we use today's drugs in conjunction with modified rest, supplemented by surgery when indicated. Drug therapy is usually used for all active disease. Streptomycin and isonicotinic acid hydrazide are major drugs. Para aminosalicylic acid is the most commonly used minor drug.

XUM

Pyrazinamide and cycloserine are minor drugs that are more recently available. Because tubercle baccilli, resistant to available drugs have grown out when drugs are used singly — we use them in combination, preferably a major and a minor, keeping one of the majors in reserve. Isonicotinic acid hydrazide and para aminosalicylic acid, or streptomycin and para aminosalicylic acid are two such combinations.

Exudative and pneumonic disease tends to resolve more rapidly than fibroid or cavitary disease. Definitive resection surgery properly timed during the course of drug therapy is used for selected cases.

We do not know how long the patient should be kept on drug therapy but we have repeatedly found it necessary to increase the average time. At present, in a general way, one might suggest as a minimum period of time on drug therapy: (a) for minimal pulmonary tuberculosis, a minimum of one year; (b) for advanced pulmonary tuberculosis, a minimum of 18 months; (c) for genitourinary, miliary and meningeal tuberculosis, a minimum of two years. These are minimum periods; drug therapy may be continued indefinitely beyond these minimum periods in the presence of continuing active disease.

The Future

SINCE the mean hospital stay is decreasing and the duration of drug therapy is increasing — we can expect that a higher proportion of patients will be returning to work while still on drug therapy. Negative sputum needs to be confirmed when the drugs have been discontinued. Relapse rates under modern treatment are not available for a long enough period of time. However, preliminary trends suggest 8% to 10%, with over half of the relapse occurring within the first year after hospital discharge. Sputum examinations and x-ray comparisons continue to be the bulwark of follow-up.

Industry and Tuberculosis

HOW DOES this affect industry? The chest x-ray as part of a pre-employment examination gives the physician in industry a permanent and valuable record of the employee and indicates the need for medical investigation with a high degree of accuracy in chest disease. Mass chest x-ray examination of all employees at stated intervals rounds out the advantages gained by pre-employment examination.

Differential diagnosis and the determination of activity in tuberculosis may be quite simple or extremely complex, and may be most easily carried out in the hospital. The employee who is known to have had active tuberculosis should be under adequate supervision. The patient who is on chemotherapy should have x-ray and sputum studies once a month. Follow-up may be provided by the family physician, by the hospital outpatient department, by the local health department, or by the Medical Department of the industry. The patient should be taught the value of a free exchange of information between these medical teams.

The patient who has had tuberculosis has always been a valuable asset to industry. He has learned to live moderately. He is usually on time, does his work well, and loses below average time for sick leave. The patient who is diagnosed early, treated by today's standards and adequately followed, will have less of a physical handicap than the patient who had tuberculosis 10 or more years ago; and he will, therefore, be an even greater asset to industry.

Summary

TUBERCULOSIS is still with us; the death rate has fallen remarkably; the incidence is slowly decreasing; treatment is a rapidly changing picture; adequate follow-up protects the patient and industry; and the patient who has had tuberculosis is a valuable asset to industry.

Pickling Baths Prefer Blondes

I REMEMBER my old friend, Dr. Richard Bennett, telling me how once, in the big iron works in Gary, Indiana, his associate physicians were having great trouble treating the skin eruptions which afflicted many of the women who worked beside the so-called pickling baths. On going through the plant, Dr. Bennett noticed that most of the women who were having trouble were either blonde or red-haired. Accordingly, he advised that only dark-skinned women be allowed to work around the pickling baths, and after that there was much less difficulty with skin eruptions. To show the great difference between the susceptibility of different skins to an irritant, I need only tell of my brother's and mother's experience with poison ivy. Years ago, when out hunting rabbits in the California hills, my brother could walk all afternoon through patches of the weed without getting into trouble. But when he came home and kissed his mother, her face would swell up. There was enough of the irritant resin dissolved in the perspiration on his face to poison her delicate skin.

—From a Comment by WALTER C. ALVAREZ, M.D., in the *Los Angeles Times*, December 23, 1956.

The Awakening Forests

F. BRUCE LAMB

EDITOR'S NOTE: *It is known to us that some few woods, notably among tropical woods, contain constituents dangerous to workmen manipulating these trees. As few investigations have been made and the information available is fragmentary, this Journal desires to encourage investigative work that better may determine the nature and extent of such damage and bring about protective procedures in order that the industry may not be hampered in its development and that the workers themselves may not be subject to occupational diseases from this source.*

A QUIET revolution is under way in the forests of tropical America that is opening up untapped resources for new industry. The long-coveted giant mahogany, exported for the manufacture of fine furniture and shipbuilding, is growing scarce, losing its hegemony to little-known trees that were once considered worthless. Cuangare foliage rising from the coastal swamps and thick stands of cativo along tidal rivers have become the symbols of a new economic era. Now the trend is away from log exports; instead, the factory is moving right into the forest, near the source of raw materials, to turn out veneers, fiberboard, plywood, and chip-board. The finished and semi-finished wood products are sold to both local and foreign markets. And thanks to Latin America's rapid industrial growth, the local market is an expanding one.

This newly discovered green gold is found in the Department of Peten, Guatemala; Derien Province, Panama; the Pacific coastal areas of Colombia and Ecuador; the Rio Atrato and Magdalena valleys of Colombia; the Yucatan peninsula; the Amazon basin. The revolution now in progress is based on new industrial techniques, but there is still much to be learned through simple trial and error. The complexity of forest growth alone raises the production problem of how to use mixed stands of wood.

The Ford Motor Company pioneered in using a mixture of tropical woods when it was developing its rubber plantations in the Amazon basin during the 1920's. Big tracts of tropical jungle had to be cleared for settlement and planting, and to utilize the felled timber a large band mill with auxiliary equipment was installed at Fordlandia on the Tapajos River. But because of the extreme variety in the characteristics and quality of the wood, several trial shipments proved unacceptable on the New York market.

Yet this and other similar failures have not discouraged venture capital from continued attempts to establish profitable wood-using enterprises at the edge of the forests. Today successful operations, all by private concerns, are based largely on the use of one or two species that, like cativo and cuangare, are relatively abundant and appear in forests limited to only a few species.

Highly prized mahogany (leafless during dry season) is no longer chief sign of forest wealth in Peten, Guatemala.

On the Pacific coast of Colombia, Industria Forestal Colombiana has organized a thriving sawmill operation based largely on cuangare (Iryanthera juruensis), which grows in almost pure stands in the swamp forests of that region. Mature cuangare trees have a round, slightly tapered, symmetrical trunk, which shoots up 60 or 70 feet to its lowest branches above the mass of tangled roots embedded in the swamp. The rough, reddish bark contains a gummy red sap that protects the logs from insect attack

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until they dry out. A market for this wood developed 10 years ago, at the end of World War II, when a trial shipment to Germany was welcomed by the reviving wood-using industries, especially for rotary veneer.

Producing lumber from the logs rejected for export, Industria Forestal Colombiana began modestly enough with a small circular sawmill, set up at Tumaco to supply local lumber needs. Organized with the help of Mexican and U.S. technicians, it was financed by Colombian, Swedish, Mexican, and U. S. capital. Now it is shipping lumber to Colombian, Caribbean island, Central American, and U. S. Gulf Coast markets. Recently a big modern bandmill was installed, with accessory equipment such as edger, band resaw, and high-speed planing mill. Both a plywood plant and a chip-board plant are projected for the future.

Industria Forestal Colombiana also experiments with other woods from the mixed tropical forest growing on higher ground, such as sande (Brosimum sp.) and tulapuerta (unidentified). Sande is a large forest tree with a spreading crown that dominates everything around it. The huge cylindrical trunk, often six feet in diameter at the base, soars 80 to 90 feet to the first branch and is covered with a smooth grayish-white bark containing a milky latex. The creamy-yellow wood should prove as popular as other blond tropical woods — primavera from Central America, for example, or korina from Africa. Tulapuerta is characterized by a large, somewhat irregular trunk that rises 50 to 60 feet to the first branches and is coated with scaly, yellowish bark. Its cocoa-brown wood is reported to be insect-resistant.

Colombians haul out mammoth cuangare trunk, raw material for the manufacture of veneer at the forest edge.

In Surinam, the Brunzeel Plywood Plant produces veneers and plywood solely from virola. Virola surinamensis is a tree that also rises above the forest canopy in swamps along the Atlantic coastal rivers in Central and South America. The wood is pale pink, lighter than Spanish cedar. Logs cannot be exported, for after cutting they are attacked by damaging insects and fungi. Because of its rapid deterioration, the wood had no commercial value until experiments proved its worth for plywood produced close to the log source.

Alto Tapajos, S.A., operating in the lower Amazon valley, is trying out the production of veneer from various tropical hardwoods for export. As with other wood products, manufacture near the source saves shipping costs on waste materials, lowering the price of the end product.

Compania Maderera del Atrato has a band sawmill and box factory in Barranquilla, Colombia, with a large production program under way, based mainly on cativo (Prioria copaifera). Like cuangare, cativo became commercially important only after World War II; its name, derived from the Italian word for "worthless," indicates how it was previously regarded. The cylindrical trunk of the cativo, which rises 50 to 60 feet to the lower limbs, is covered with a smooth whitish bark on young trees. As the tree matures, the bark becomes rough and scaly, and its sticky yellow resin attracts many kinds of insects. The publication of test data on the wood's characteristics by Professor Kynoch, of the University of Michigan, and description of stands in publications of the Yale School of Forestry brought cativo to the attention of the wood-using indus-

Dragging timber from swamp forest by barge with a double drum winch. Loggers must be tough to withstand rugged living conditions.

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Bush Negro shack in Surinam logging camp.

tries. Heavy, nearly pure stands of this tree are easily accessible along the flood plains of many rivers from Costa Rica to Colombia, and a ready market has been developed for cativo veneer and plywood in Panama, Mexico, and the United States.

Still another plant, a plywood factory at Las Quebradas, Guatemala, has found uses for several Guatemalan woods that previously had little value, and is now manufacturing veneer and plywood for the local market and for export.

Several sawmill, veneer, and plywood operations have sprung up since the war in the Yucatan peninsula of Mexico. At first they used mahogany (Swietenia macrophylla) and Spanish cedar (Cedrella mexicana), but they were forced to diversify as these woods became scarce. One of the most spectacular examples of jungle-taming to make the forest productive is the operation started by Alfredo Medina, of Mexico, at Colonia, Yucatan. From a small sawmill it mushroomed into a modern town with huge plants producing tons of plywood, school desks, knock-down furniture, and prefabricated houses. Later Medina organized an airlift to fly provisions, water, even mules, into the heart of the jungle and open up a remote production center at Zoh Laguna. This was no timber raid; he replanted the forest as he cut.

LOGGING operations are inevitably carried out under the most primitive conditions, demanding a durable breed of workmen and superintendents. In the cuangare swamps of Colombia, for example, the men work from boats, spending many of their working hours waist-deep in muck and returning at night to huts built on stilts in the swamp. Under such conditions, safe drinking water is hard to come by, and the workmen were delighted when I introduced them to the water vine, which grows throughout Central and South America and when whacked into sections furnishes a sweet drink to quench the thirst. Logging in the mahogany areas of Central America takes place during the dry season, often under choking dust conditions. Fire is a constant hazard, and there is scarcely enough water for brushing teeth, let alone a shower. Clearly, ingenuity is as necessary to these men as technical training.

At Colonia, Yucatan, worker morale hit a new low when the town was infested with snakes and several people were fatally bitten at night by the fer-de-lance. A Cuban friend of Alfredo Medina's suggested that geese would get rid of the snakes. Several pairs were brought in, and soon the workers and their families could attend the evening movies unmolested. Medina, in turn, passed the word along to a Venezuelan colleague.

Technicians from other areas, no matter how highly trained, must be flexible enough to adapt to new and strange conditions that confront them in the tropical forests. A plywood technician, for instance, finds his customary glue mixtures and drying schedules entirely inadequate. If the technical books he has brought along do not yield the answer, he must develop new procedures on his own.

Despite the hazards, these operations form the nucleus for integrated forest industries using a wider variety of mixed tropical hardwoods than was ever thought possible. Fiberboard, chipboard, and paper pulp are the most promising

Log pond at the Brunzeel Plywood Plant, Surinam, which makes plywood and veneer from the pale pink wood called virola.

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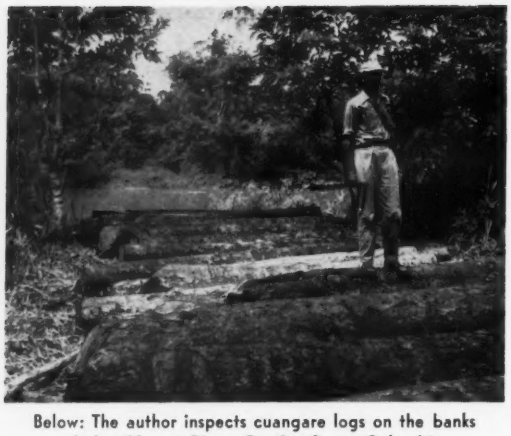

Below: The author inspects cuangare logs on the banks of the Chagui River, Pacific Coast Colombia.

products from the standpoint of using all commercial-sized trees of any species as they grow in the tropical forest, rather than selective cutting of a few species. To make fiberboard, the wood is ground up, cooked, and pressed into large panels. For chip-board the wood is cut into fine chips, then mixed with an adhesive and pressed into panels. While isolated plants are producing both products in Mexico and Colombia, they are not as yet integrated with other industries. A pilot plant has been set up in Africa to experiment with the pulping of 50 mixed tropical hardwoods for paper production, and studies are now being carried out in tropical American forests to determine the feasibility of producing paper from raw materials there. Perhaps the ideal combination for the widest use of woods from the mixed forest would be integration of a sawmill with a prefabrication plant, producing materials cut to specified sizes for door frames, window frames, furniture, and so on; a veneer and plywood mill; chip-board and fiberboard plants; and a pulp mill. Such an industrial complex would require sound economic planning to protect the large capital investment necessary. The timber areas would have to be large enough to pay off the investment. Location is still another consideration; the timber must be reasonably accessible to markets.

MEANWHILE, we must develop tropical forest management techniques to keep pace with advancing production methods. Actually, little is known about this phase of the industry. It has not yet been determined whether it is better to convert the forest to a less complex pattern of growth of the more valuable species as the cutting proceeds or to try to maintain the natural mixture. Most cutting operations in the American tropics still aim at extracting a few widely scattered valuable species, leaving the forest relatively intact but without provision for reproducing the most valuable growing stock.

It is a widespread fallacy that land supporting rich tropical forest is also rich agricultural land. A tropical forest maintains its luxuriance by holding nutrients in a closed cycle between the vegetation and a thin top layer of the soil. When the land is cleared for agriculture, the cycle is broken; within a year the intense rays of the tropical sun and torrential rains destroy or carry away most of the plant nutrients. Crops fail, the land is abandoned, and worthless brush grows up, beginning the long process of restoring the land to its original cover of tropical forest. Perhaps eventually a solution to this can be worked out by combining agricultural and forestry programs, so that forest trees are planted before the land is abandoned. This is where the governments come in, with land use, classification, and forest surveys.

Some progress has been made with forestry management, notably at the U.S. Tropical Forest Experiment Station in Puerto Rico, at the Inter-American Institute of Agricultural Sciences in Costa Rica, in the Tropical Section of the Mexican Forest Department in the Yucatan peninsula, and in the forestry departments of various other American countries with the aid of Point IV forestry technicians. An exchange of technical information on forestry problems is provided by the Sociedad Dasonomica de America Tropical, with headquarters in Cuba, and through such periodicals as *The Caribbean Forester,* published in Puerto Rico by the U.S. Forest Service, and *Tropical Woods,* published by the Yale School of Forestry. But the material in these publications does not always penetrate to the practical working level.

Tropical forestry training is available at the University of the Andes in Venezuela, the University of Medellin in Colombia, the National University at Bogota, and at the forestry school in Chapingo, Mexico. Short training courses are held at the Tropical Forest Experiment Station in Puerto Rico, and at various places in Central America, organized by the Inter-American Institute. A few outstanding students receive scholarships for advanced forestry training at universities of North America and Europe, but in many cases their educational preparation is not used to best advantage owing to a lack of government coordination.

None of these difficulties, though, should be allowed to deter the awakening forests. The factories that are springing up augur well for the economic future of tropical America.

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Dermatology in Industrial Medicine

I. What is your concept of pre-employment examination insofar as it pertains to prevention of occupational dermatoses?

THE COMMITTEE *on Dermatology of the Industrial Medical Association has inaugurated a project in which questions of practical aspects of occupational dermatoses are posed by the Committee and answered by members of the Committee. Following are answers by two members to the first question as stated above:*

(1) FRANK C. COMBES, M.D.
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THE PRE-EMPLOYMENT examination is the "keystone" of industrial health. The longer one practices industrial medicine the more one is convinced of the truth of this statement. Of all tools used in industry, the human tools are most important. The artisan devotes much time and attention to inspecting his equipment, implements and machines before putting them into actual use. He is interested in their quality, durability and potential weaknesses. Why should industry not take equal interest in those who operate these machines and use this equipment? It is true that for the last 40 years, many larger industrial establishments have conducted pre-employment physical examinations, but little attention has been paid to the skin, although industrial cutaneous affections (according to available statistics) constitute the largest group of occupational disease claims of any one type of cause (over 60%). For most small concerns no physical examinations whatever are made. The reason may be ignorance, or the fact that state and Federal laws regulating industry fail to cover this phase of control. Workmen's Compensation Boards and Industrial Commissions are most interested in the worker *after* he is injured, particularly as to the degree of disability, compensation therefor, and whether the claimant is working.

The skin, because of its close anatomic and functional connection with other organs cannot, for our purpose, be examined in a restrictive sense, but must be considered in its relationship to the body corporate. This poses the question as to whether the examination should be conducted by a dermatologist or by an industrial physician. Unless the dermatologist has a basic, interpretive concept of industrial medicine I think the industrial physician better qualified.

The pre-employment examination can be intelligently done neither by the part-time industrial physician nor the part-time industrial dermatologist. The examiner should be someone who has had graduate training and adequate experience in this phase of medicine, and who is conversant with the intrinsic and extrinsic health hazards of industry in general and with those of the establishment for which he is conducting the examination. He should be as well acquainted with the operational methods of the business and its personnel as he is with those of his own home and family. He should know the specific type of activity the applicant will be called upon to perform; the type of materials he will handle; to what dusts he will be exposed; the temperature and humidity levels under which he will work, and many other significant details pertinent to his particular plant or factory.

Having decided on his qualifications, what should the examiner look for in the prospective employee which is likely to predispose him to an industrial dermatosis, or possibly some conditions making him personally objectionable or even a potential health risk to fellow employees?

These latter conditions include infectious disease, parasitic infestation, or objectionable body odor. In some occupations relatively minor dermatologic defects are cause for rejection. Severe acne, acne scarring, vitiligo, unusual nevi, psoriasis and other cosmetically nonesthetic dermatoses are often cause for rejection in the army, navy, marine corps, fire and police departments, and industries requiring employees to live and eat together.

Obviously, details of the examination necessary for each individual industry are subject to wide variation but there are certain basic principles and procedures that can be annotated. Each examiner should decide on an appropriate examination routine and adhere to it.

The dermatological examination should follow the general physical examination by the internist; and the dermatologist should have access to the results of this examination — the blood count, urinalysis, serologic test for syphilis, chest roentgenogram, and other tests considered necessary. It is appropriate at this time to state that it is neither advisable nor necessary that all applicants fulfill the requirements, or that all requirements be fulfilled by each applicant. One

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purpose of the pre-employment examination, which is often unappreciated, is that in addition to supplying information regarding the health of the applicant, it supplies information for his proper placement. The individual with a tendency to dryness of the skin and chapped hands may be able to work in the shipping room or packaging department of a concern but not participate in the actual manufacturing activities.

The examination is preferably made *prior* to the employment of the applicant. However, if there is a question or uncertainty as to his qualifications, other than physical fitness, the examination may be postponed for a period not exceeding 14 days.

The dermatologist should not neglect to consider and record the age (actual and apparent), sex, race, marital status, general health, previous dermatergoses, and previous types of employment. In order to do this he must have a comprehensive history of the applicant, not only his industrial history but also his general medical history since infancy, particularly as these relate to the skin and skin disease.

Suggested Routine Dermatological Examination

NAME, age, race, sex, marital status, complexion, color and health of the scalp and lanugo hair, and dermal texture (face, trunk and extremities).

1. *Head*: Examine especially for scars, pediculosis, tinea, seborrheic dermatitis, conjunctivitis; the eyelids (blepharitis, neurodermatitis, contact dermatitis, seborrheic dermatitis), nasal or aural discharge, sinusitis, acne and sycosis.

2. *Mouth*: Examine especially for leukoplakia, pyorrhea, cheilitis actinica and badly infected tonsils.

3. *Neck*: Examine especially for scars, palpable lymph nodes and enlarged thyroid.

4. *Upper extremities*: Examine especially for scars, condition of circulation, deformities, keratosis pilaris, hyperhidrosis of palms, interdigital erosions, eruptions, paronychia, condition of nail plates, callosities.

5. *Trunk*: Examine especially for scars, pigmentation and cutaneous eruptions.

6. *Perineum*: Examine especially for scars, perineal and anal dermatitis, perianal sinus, dimpling over coccyx, hemorrhoids, anal fissures, intertrigo, tinea, vaginal and urethral discharge.

7. *Lower extremities*: (The examinee should sit on the edge of a table with the legs hanging down) Examine especially for scars, deformities, varicose veins, ulcers, pigmentation, eruption, tinea, hyperhidrosis plantaris, painful plantar warts and callosities.

There are many systemic defects and many non-dermatologic diseases which predispose the worker to industrially-related dermatoses. The examiner should recognize these, make note of them and take whatever measures he deems advisable to place the applicant in a "safe" job. Certainly varicose veins should preclude employment in any job requiring long periods of standing or working on cold, damp concrete floors. Numerous scars on the forearms and legs should suggest the "accident-prone" individual. Applicants with extensive vitiligo are particularly prone to contact dermatitis and intertrigo. The presence of a chronic discharging sinus, ear or nose, or osteomyelitis may, as a sequence of some minor trauma breaking the skin, result in infectious eczematoid dermatitis or dermatitis repens, which are extremely recalcitrant unless the original focus is eliminated. This may be impossible.

Diabetes may be responsible for infections developing in minor cutaneous injuries.

The chapped skin, and individuals with keratosis pilaris, hypothyroidism, the hypometabolic state with extremely dry skin, are more prone to allergic sensitization than others. Furthermore they are prone to primary irritation from degreasing agents, volatile oils, turpentine, ether, alcohol, menthol, camphor — all of which are also more readily absorbed by the dry skin.

The applicant for employment as a food handler, dishwasher, cook, counterman, salad or sandwich maker, fruit handler, cannery worker, or other employment requiring prolonged immersion of the hands, should be refused employment if there is ridging and deformity of the finger nail plates, indicating a predilection to paronychia.

Dermatophytosis (T. pedis) without doubt is capable of making the skin more sensitive to contactants than it would otherwise have been. Furthermore, the potentiality of a palmar dermatophytid always exists, and, if it occurs, a superimposed contact dermatitis may eventuate in total disability of the worker for an extended period. In all cases, on the occasion of the pre-employment examination, if there is presumptive evidence of fungous infection of the feet or elsewhere, scrapings should be done to establish a diagnosis, and in addition a trichophytin test. A positive test may not be diagnostically significant, but a negative one is generally accepted as indicative that the dermatosis is not etiologically related to an existent or pre-existent fungous infection.

Individuals with an allergic diathesis, the atopic, the ones afflicted with the so-called "eczema-hayfever-asthma-syndrome," are no more prone to develop allergic contact dermatitis than others. Nevertheless, since their skin is unusually dry, and since they habitually sweat less, they are prone to primary irritation, especially from soaps, other cleansers, and degreasing agents. Space does not permit further elaboration of this important aspect of the pre-employment examination.

There is, however, an additional phase of extreme importance, both medically and economically. A significant number of dermatoses are initiated or aggravated by environmental trauma —

mechanical, chemical, actinic, or thermal. In dermatoses such as psoriasis, lichen planus and discoid lupus erythematosus, all primarily systemic, the sites of the cutaneous lesions are determined in large measure by trauma. Unfortunately all three are prone to spontaneous remissions, so that on the occasion of the pre-employment examination little evidence of their existence may be detected. A comprehensive history and a meticulous visual examination of the skin should disclose some indication of their presence.

Suppose a worker has psoriasis, limited to the scalp, elbows, or knees. While working, his hands are exposed to primary irritants sufficient to cause contact dermatitis. The result is extensive palmar psoriasis with deep fissures and hyperkeratosis. His palmar disease is compensable and at a future date, although unemployed or working for another establishment, the original carrier might encounter considerable difficulty in controverting responsibility of the worker's former occupation as causally responsible.

Workers with lupus erythematosus are often sensitive to sunlight and other sources of actinic radiation. This is important in the metal smelting industry, and in acetylene, electric and carbon arc welding. Care must also be taken carefully to screen applicants who have solar sensitive dermatoses in industries in which solar sensitizing chemicals are handled.

In industries in which the worker is exposed to tars, pitch, asphalt, halowax, petroleum and shale oils, attention should be given to the presence of acne, acneform eruptions, chronic actinic dermatitis, keratomas and epitheliomas on areas habitually exposed to sunlight. Many of these substances are prone to aggravate or provoke these dermatoses.

For workers exposed to x-rays, radium, mesothorium, metallic dusts, and in those exposed to unusual ranges of temperature and humidity, special examinations are necessary.

Seborrhea and excessive oiliness of the skin, while actually protective in some industries, may be provocative to disability in others For instance, women and individuals with seborrhea, and those who perspire freely are more susceptible to tetryl toxicity, the yellow powder adhering to the skin, and, being lipid-soluble, is readily absorbed.

The oily skin is less sensitive to cold, acids, alkalies and aqueous solutions although more sensitive to some dyes, halogens, and substances which like tetryl and trinitrotoluol are readily soluble in oils. It also seems to be more sensitive to some of the complex organic sulfur compounds.

Increased perspiration predisposes to cutaneous irritation by silica, feldspar, quartz and metallic dusts, especially arsenic where the most common and troublesome effect is the production of various skin lesions, especially scrotal edema. It also predisposes to cutaneous absorption of metallic dusts with systemic intoxication. Excessive perspiration and an oily skin also predispose to allergization to woods, suggesting the possibility that the allergen is volatile.

Before concluding, mention should be made of the importance of periodic *re*-examination of employees, the frequency depending on the nature of the occupation of the individual workman or group of workmen. Let us assume that all employees in a plant are re-examined annually, certain groups, because of specific hazards affecting their skins may require more frequent re-examination.

These periodic and pre-employment examinations constitute a bulwark against dermatoses of industrial pathogenesis and are the best means of maintaining optimum efficiency and health. No adequate health program deserves such designation where the management, or those in executive positions, fail to require comprehensive pre-employment and periodic dermatological examinations, not only of those in the shop but also of those in the executive suite.

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(2) RAYMOND R. SUSKIND, M.D.
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SINCE the skin is the most exposed organ system, it is frequently the most vulnerable. In many industries, occupational skin diseases occupy a position of numerical prominence. It would seem quite logical, therefore, that in an industrial plant where pre-employment examinations are provided it would be of great value to include a thoroughgoing cutaneous survey. Such a survey is imperative if the applicant is applying for work which entails exposure factors potentially hazardous to the skin. It provides a means of determining not only whether the candidate for employment will be able to tolerate a set of physical or chemical conditions, but it provides also a valuable medical record which may enable a physician or a compensation board, at a later date, to distinguish between a dermatitis caused by the worker's present occupation and a pre-existing skin disease, either of nonoccupational or of occupational origin.

When the history is being taken, it is essential to question the candidate about previous dermatologic and allergic diseases. Is there a history of infantile eczema, seborrheic dermatitis, atopic dermatitis, asthma, hay fever, ichthyosis, frequent pyogenic infections, "athlete's foot," tinea cruris or corporis, fungal infection of the nail, hyperhidrosis or dyshidrosis, eczematous dermatitis of contact origin, chronic or recurrent dermatitis of other origin, localized neurodermatitis, "itchy skin," photosensitivity, psoriasis, lichen planus or juvenile acne vulgaris? These are some of the problems which may be significant in the

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placement of the applicant. The details of a previously existing skin problem should be recorded in terms of site of onset, duration, etiology (if it is known) and response to therapy. The pre-employment inspection should be carried out with the applicant completely disrobed and should include the entire cutaneous surface, oral, rectal and genital areas, nails, and the scalp. The type of skin should be observed. Is it fair, thin and freckled, or brunette and swarthy? Is it oily or dry? Are there nevi, keratoses, scars, comedones? Are there any significant cutaneous abnormalities?

The important question to be answered by the skin survey is:

What type of work conditions, if any, should the applicant avoid? The cutaneous limitations may be minimal and not interfere with the work assignment for which the examinee has applied. On the other hand, it may be such that a variety of exposure conditions common to the particular plant should be avoided. This may render the applicant ineligible for a large number of jobs. Let us cite some examples:

Persons with active eczematous dermatitis of any origin and especially involving the hands, seborrheic dermatitis of the face, trunk and crural areas, tinea pedis with an id reaction on the hands, so called dyshidrosis, ichthyosis and atopic dermatitis are not likely to tolerate exposures to primary irritants or sensitizers. The cutaneous epidermal barrier in most of these problems is damaged and the irritant or sensitizer is probably more readily absorbed. From a physical standpoint, the skin of an applicant with one of these dermatoses is somewhat more vulnerable, vigilance and hygienic precautions notwithstanding. It would also be unwise to assign persons with such dermatoses or with chronically dry or itching skin, to wet work in which there is a repeated or prolonged aqueous exposure, or to processes in which there is frequent contact with organic solvents.

High temperature exposures accompanied by profuse sweating are not tolerated by persons with eczematous dermatoses of the hands and feet, intertriginous problems of any origin, urticaria, atopic dermatitis, so called dyshidrosis and seborrheic dermatitis; these problems appear to flare in humid work atmospheres as well. New lesions of lichen planus and psoriasis may be incited by mechanical friction and pressure. Persons with fair and freckling skin, and especially those with a history of premalignant keratoses and epitheliomas, or with a history of actinic hypersensitivity, should avoid being given assignments of prolonged outdoor work. Patients with some skin affections cannot be assigned to certain operations because of the effect on the materials handled. The sweat of a person with hyperhidrosis will sometimes impair the precision machined or highly polished surface of ferrous metal parts. The preferential assignment of men to a job on the basis that their skin is less susceptible to irritants than is the skin of the female of the species, cannot be supported by facts. Although oil folliculitis appears more prevalent in hairy persons, a minimum of good plant housekeeping and personal hygiene in any machine shop will prevent oil folliculitis and acne no matter what the type of skin. Acne from chlorinated hydrocarbons will affect any type of skin if exposure is adequate.

The decision of whether a particular applicant may be assigned to a specific work exposure cannot be made by a set of rules. The clinical facts in each case in question, e.g., type of skin, severity of the dermatitis, etc., must be weighed carefully against the known conditions of work. The cutaneous appraisal in the pre-employment examination or preplacement inventory is in many industries an item of major importance in the control and prevention of occupational skin diseases.

Finally, if there is some question as to whether a specific problem developed since or existed prior to or at the time the employee was hired, a record of a thoroughgoing skin examination prior to employment (which lists information as to type, location and severity of the dermatitis) is frequently helpful in providing the answer. It provides a means of avoiding medicolegal difficulties, and is helpful in resolving compensation problems.

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Security

WHAT makes for real security is freedom from the meddling of the state. It is the sense of independence which derives from a man's ability to provide for himself and his family. Most important, it is security within the individual, an integration of the personality which can only derive from a coherent view of human existence. The community has obligations to the poor and helpless among it. But once the state thinks it can and should make all its members secure it falls into delusions of Deity. As the world should know, the consequences can be tragic.

—From "Review and Outlook" in *The Wall Street Journal*, December 26, 1956.

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Survey of the Occupational Environment

An Essential of Industrial Medical Practice

THIS treatise is intended primarily for those physicians who serve industry on call; those physicians whose private clientele includes industrial employees; and those to whom industrial employees come for preplacement, periodic, or other types of physical examination, diagnosis, or treatment. Its purpose is to promote greater interest, knowledge, and activity in occupational health on the part of all physicians who are, or should be, concerned. Full-time industrial Medical Directors and staff physicians presumably are well acquainted with the matters discussed, as are most physicians occupying such positions part time. However, they might find in this treatise worth-while reminders.

The physician may gain much through a personal survey of the occupational environment of persons who are under his supervision or of those who are or may become his patients. Increasingly in the large plant and especially where there is a well-organized Medical Department, the industrial physician observes operations and the conditions under which the employees are working. This practice should be adopted by the physician who has an "on-call" relationship with industrial plants. After each survey, the physician should discuss his observations with management with particular recognition of the fact that the assistance of several disciplines is usually necessary to control a given situation.

General practitioners whose patients include industrial workers can and should acquire some knowledge of the industrial operations of the area through organized plant tours or invitational open-house arrangements between the industries and the local medical society.

Manifold advantages are to be gained from a survey of the occupational environment. The information obtained may permit the physician more adequately to diagnose and treat disease affecting his patient. As an example, a persistent hepatitis may fail to respond to treatment. Inquiry into the patient's occupation may disclose exposure to a chlorinated hydrocarbon solvent vapor as the possible cause. Only after this exposure is evaluated and brought under satisfactory control can the patient's hepatitis be alleviated and, of equal importance, development of hepatitis in other workers at the operation be avoided.

Similarly, the survey permits the physician to become familiar with the physical and mental demands of the job. It gives him the opportunity to see the people at work, in circumstances in which they are much more likely to be at ease than in his office. In addition he can become acquainted with materials and operations, the nature of exposure to substances and conditions that may affect health, and the physical conditions that may be the cause of accidents. It is important, however, at this point to caution the physician against hasty and unsubstantiated conclusions.

The physician is thus in better position to help in matching the physical abilities of a prospective employee with job requirements. He has a better understanding of the industrial health hazards as they actually exist in a given plant and at a specific operation. This knowledge of the environment permits him to take a more effective part in the prevention of occupational diseases and in accident prevention. What then is the first approach in making an initial survey of a plant and what should be looked for?

Preliminary to the Survey

ARRANGEMENTS for an initial plant survey should be made invariably with management or an appropriate representative of management. Where the plant is small, there should be a discussion of the purposes of the survey with the head of the concern and the physician serving the plant. If the plant is a division of a larger organization, inquiry should be made through local management as to whether there is a Medical Director or consultant who supervises occupational health throughout all plants. If so, the physician should communicate with him. Both management and medical advisers would be expected to welcome such interest in plant conditions on the part of a general practitioner or on-call physician. In preparation for the survey, the physician should acquaint himself with the workmen's compensation act and the industrial health and safety regulations of the state.

In the actual conduct of the survey, management should designate someone familiar with the plant to accompany the physician through the various departments. In the larger concerns the safety director or the industrial hygienist would be the logical selection, since he would be well informed as to operations and potentially hazardous conditions, and as to the means of safeguarding workers against them. Prior to making the trip through the plant, the physician should discuss conditions with the person who is to accompany him.

A review of plant dispensary records should be made with special reference to minor complaints and

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injuries as well as lost-time injuries. It is to be hoped that there may have been some analysis of these data relative to major causes of injury, preferably in accordance with the code of the American Standards Association.[1] Special note should be taken of symptoms or complaints reported, particularly if recurrent in the same person or in different persons in the same department. If periodic physical examinations have been made, positive findings that may be associated with occupation help to point out those operations especially to be noted in the survey.

The Survey

SEVERAL types of surveys that vary in their purposes and thoroughness are well discussed by Patty.[2] He not only notes the information that should be gained in these surveys but also includes pertinent comments on proper conduct within the plant on the part of the person making the survey.

Conditions to be watched for are described briefly in the following paragraphs. Where such conditions are found, the physician should become more completely informed through references such as are listed by the Council on Industrial Health of the American Medical Association.[3]

Potential Health Hazards

INJURIOUS MATERIALS: *Dusts (Pneumoconiosis)*—The hazard presented by dust in an occupational environment is dependent on a number of factors. It is necessary first to know something of its composition. Abrasive blasting may involve free silica in the form of quartz if a flint or sand abrasive is used. In this case, the dust exposure of the worker must be kept at a low level if silicosis is to be avoided. On the other hand, where steel abrasive is used to remove scale from steel forgings, the dust contains no silica and consequently need not be kept under as meticulous control as in the former instance.

The maximum amount of dust that can be considered acceptable depends not only on its composition but also on its particle size and the duration of exposure. Generally, dusts present in work atmospheres include appreciable proportions sufficiently small to reach the alveoli. The exceptions are rare. In regard to duration of exposure (not only to dusts but also to other hazardous materials), an operation may be observed to be brief, but inquiry should be made as to whether it is repeated during the day, and how often. Where production involves a number of diverse operations, it is well to inquire whether activity at other periods during the day or week may involve exposures greater than those observed.

The dusts most likely to produce disabling pulmonary involvement are those containing free silica, i.e., silicon dioxide not chemically combined with other elements. Such dusts occur frequently in industry. Inquiry should be specific in regard to this component, especially since the presence of free silica may not be readily apparent. For example, soapstone powder, widely used to keep layers of unvulcanized rubber from sticking together, may contain from 0 to 17% of free silica, depending on its source. The most common form of free silica is quartz, which occurs widely in nature. Natural materials widely used in industry that should be regarded as potentially productive of silicosis because of their high free-silica content are granite, flint, sandstone, sand, tripoli, and diatomaceous earth.

Dusts containing asbestos should also be noted, because prolonged exposure to asbestos dust in excessive concentration may result in a type of pneumoconiosis known as asbestosis, which may be disabling. In coal mining and handling, attention should be given to the possible development of coal workers' pneumoconiosis, a recently recognized but incompletely explored clinical condition due to exposure to coal dust, per se, as well as to the possibility of silicosis from exposure to free silica in the rock associated with the coal in certain areas.

Metals and Their Compounds—A large number of metals and their compounds are used throughout industry. As a potential industrial health hazard, the most prominent of these is lead, which may be present alone or in a wide variety of compounds. The chief mode of entry is inhalation of dust or fume. Percutaneous absorption of metallic lead and inorganic lead compounds is insignificant, but tetraethyl lead and a few other organic compounds of lead may be absorbed through the skin under suitable conditions. Molten lead ordinarily does not present a hazard unless its temperature is well above its melting point. Special attention should be given to operations where lead may be subjected to temperatures above its boiling point, as in the welding of leaded steel. It is wise to have persons who work regularly with lead checked periodically for the extent of their lead absorption by determination of lead in blood or urine.

Lead compounds may be known by a number of names not including the word lead. Litharge, the common name for one of the oxides of lead, is found in the paste of lead storage battery plates, in a cement for attaching glass to metal, in "doctor" solution in petroleum refining, and in the manufacture of chrome yellow pigment. Although the specific gravity of this compound is high, litharge is often so fine that when dispersed into the atmosphere it will persist long enough to cause excessive exposure if adequate control measures are not in effect. In most industrial operations where dusty lead compounds are used or produced, it is desirable to have an evaluation of the exposure made with the aid of laboratory analysis of the air or of samples of the blood or urine of exposed employees, or by the combined investigation of the environment and the personnel.

Other toxic metals to which the physician should be particularly alert include antimony, arsenic, beryllium, cadmium, cobalt, manganese, mercury, and phosphorus. Exposure may occur in mining, metal-refining, fabrication, and metal-cleaning operations. Welding or high-temperature cutting on cadmium-plated surfaces can be particularly hazardous. The toxicity of beryllium is so extreme that it is in a category of its own. Mercury is of special importance because hazardous concentrations of vapor are released from the liquid metal even at room temperature. The dust of various mercury compounds is also toxic. Chromium in the form of chromic acid

mist is commonly found in chromium electroplating or as salts of chromic acid in the form of dust, and may cause ulceration of the skin or the nasal septum. Zinc in the form of fresh zinc oxide fume, such as may arise from a bath of molten zinc at a galvanizing operation, may cause the temporarily disabling illness known as metal fume fever.

Excessive exposure to iron dust or fume as produced in welding, gas cutting, or grinding may cause sufficient retention in the lung to show as nodulation on chest films, but the condition is not regarded as disabling. These changes are somewhat erroneously interpreted as silicosis.

Whereas the pneumoconiosis-producing dusts usually require prolonged periods of exposure (years) to produce their effects, very brief exposures to toxic metals, solvent vapors, and gases can cause illness. Thus it is important that the physician be alert to the possibility that operations of brief duration may entail exposures more severe than those observed at the time of his survey.

Solvents—In observing operations involving solvents, the physician should consider the possibility of absorption through the skin, in addition to absorption through the respiratory tract. Contact of these materials with the skin not only provides an avenue of introduction into the body but also presents the possibility of dermatitis.

There is a wide range of hazard potential among the many solvents used in industry. This is governed by the volatility of the solvent as well as by its toxicity. The exact chemical name of the solvent should be obtained. This need is illustrated by the two solvents, tetrachloroethylene and tetrachloroetnane. There is only a slight difference in their names, but the toxicity of the former is indicated by a maximum acceptable concentration in the atmosphere of 200 parts per million as against 5 ppm for the latter —and they are of essentially the same volatility.

One of the frequent uses of solvents in a great variety of plants is in equipment known as the vapor degreaser. This is essentially a tank in which a solvent, often trichloroethylene, is vaporized by heating, and metal parts to be degreased are placed in the hot vapor. Such equipment can be used without excessive exposure to the operator, but a considerable number of poor practices, as listed by Horowitz,[4] can result in exposure beyond the recommended limit. Benzol (benzene), carbon tetrachloride, carbon disulfide, and methanol are other industrial solvents that may cause serious illness if not used under properly controlled conditions.

Gases—In general, potentially hazardous exposure to gases is not obvious in occupational environments. For example, a visit to a gasoline engine test room may fail to indicate the presence of a moderate carbon monoxide hazard. Where carbon monoxide may occur by leakage from a pipe line, or by impingement of a gas flame upon a cold surface with resultant incomplete combustion, or by its use as a reducing gas in a heat-treating department, inquiry should be made into the occurrence of headache among the employees such as would result from moderately elevated concentrations over a number of hours or throughout the day. In addition, the possibility of accidental liberation of high concentrations that may result in asphyxiation should be kept in mind.

These two elements of hazard apply to exposure to a number of other gases. The more prominent symptom from moderately excessive exposure to hydrogen sulfide is irritation of the eye rather than headache, but the danger of rapid asphyxiation is even greater than that from carbon monoxide. Experience has shown that the odor of hydrogen sulfide is no safeguard against excessive exposure, because even brief exposure to sufficiently high concentration results in the loss of the ability to smell this gas.

A number of gases are brought into plants in cylinders in the form of liquids under pressure. These include hydrogen fluoride, used in certain oil-refining processes and in the chemical industry; hydrogen cyanide and methyl bromide, both used for fumigation and for other purposes; and chlorine, widely used for bleaching, in water treatment, and as a bactericide. Other toxic gases include ozone, nitrogen dioxide, and sulphur dioxide.

Dermatitis-Producing Materials—The phase of the survey dealing with dermatitis-producing materials may best start with the industrial nurse who probably will be well informed of the incidence of dermatoses. For example, if no cases from cutting oils and compounds have come to her attention, this source of dermatoses may require no further investigation, but, if numbers of minor cases with an occasional serious case have occurred, this situation should be thoroughly investigated. Attention should be given to washing facilities, soaps and cleansers used, and the availability of hot water. Personal washing procedures as well as other measures such as protective creams and equipment should also be checked.

In addition to solvents, innumerable other primary irritants and sensitizers cause skin affections. Wherever there is skin contact with primary irritants, which may include not only strong acids and alkalis in an electroplating department but even dishwater in a plant cafeteria, there may be some incidence of dermatitis. Skin contact with such materials should of course be avoided, though this is difficult in some operations.

Among the many sensitizers, exposure to those involved in the preparation of synthetic resins and in the manufacture of plastics is worthy of note. The effect on the skin may be caused by contact either with dust or with gases liberated during these processes.

Where waxes are used for impregnation of electric condensers or for wire and cable insulation, inquiry should be made as to whether these are chlorinated naphthalene or diphenyl compounds. If so, suitable precautions (often listed by the producer) should be followed.

Pathogenic Microorganisms—A number of occupations involve exposure to pathogenic microorganisms, through their incidental introduction into lacerations. In packing houses, measures to avoid brucellosis and psittacosis should be noted. In plants that handle imported animal products, such as hair, bristles, wool, and hides, investigation should be made of the need for sterilization of these materials and, if in order, the method used. Workmen in these

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plants should be told what an anthrax pustule looks like and impressed with the need for immediate medical attention for such a lesion.

Other Materials—Materials other than those falling within the foregoing classifications should not be overlooked. Examples of such materials are those capable of inducing cancers, including chromium compounds (lung), beta-napthylamine and benzidine (urinary bladder), and certain polycyclic hydrocarbons that may be present in coal tars and in certain high-boiling catalytically cracked oils (skin). Surveys of industrial exposure to the cancerogens should be supplemented by epidemiological investigations. A single case of cancer hardly proves a cause-and-effect relationship where exposure to a suspected cancerogen is involved, but incidence of such cases significantly in excess of that occurring in the general population would point to the occupational exposure as a possible cause.

Hazardous Conditions

IN ADDITION to hazardous materials, observations should include hazardous conditions. These may be covered under the following headings.

Excessive Noise—Exposure, particularly of long duration, to excessive noise levels may cause diminished acuity of hearing. Although sufficient data are not yet available on which to specify a precise level of sound of a given frequency that can be taken as a maximum acceptable level, certainly those noise conditions where one must shout within an inch or two of the ear to make oneself heard should be noted in a survey of potentially injurious conditions. The physician, upon finding such conditions, should recommend that a study be made of the noisy environment to determine whether the intensities at existing frequencies are excessive and, if so, to determine whether practical noise-reduction measures can be taken. He might also recommend that an audiometric examination program be instituted.

Extremes of Atmospheric Pressure—Extremes of atmospheric pressure include the high pressures encountered in foundation and tunnel construction, and in diving operations, and the low pressures of flying at high altitudes. Foundation and tunneling operations under pressure tend to be among the more hazardous.

It is likely that a full-time or part-time physician will be connected with such construction operations. Other physicians in the area may be called upon because of some temporary unavailability of the physician normally responsible, or in event of an accident causing a number of serious injuries. Also their patients may be engaged in such work. Accordingly it is desirable for physicians in the area to visit the project, become informed on compression and decompression schedules, and become familiar with the physical examinations given new workers and with instructions to workers such as checking with the physician before going under pressure in case of a coryza or ear block. Particularly where high pressures are used, the physician should become completely informed on operating conditions before he decides to enter a pressurized area. It would appear prudent for only the younger physician to do so.

In aviation medicine, it is now generally accepted that physicians should be familiar with the effects of low pressures and of too rapid subjection of the body to pressure changes.

Low pressures from high-altitude construction or mining operations are not ordinarily within the purview of most physicians. It is assumed that physicians at operations in such locations will be informed about the physiological aspects of working and living under low pressures—also about the decrease in maximum acceptable concentrations of gases, dusts and toxic materials, as larger volume of the thinner air must be respired.

Extremes of Temperature: Heat—In many plants the problems of heat in summertime are no different from those in nonindustrial environments generally. Since the evaporation of perspiration causes cooling of the skin, usually the better the air movement, the greater the comfort. Although high humidity in itself creates no harmful effects, it does limit the rate of evaporative cooling of the skin and can be expected to intensify the effects of high temperatures.

Many plants have local "hot spots," such as ovens, heat-treat baths, and furnaces, that cause excessive exposure to radiant heat as contrasted with heat carried by convection, or hot air. In the steel, glass, foundry, and other industries where processing is built around large-scale melting operations, control of radiant heat is a major problem.

A given amount of heat transferred to a man will have the same effect regardless of the means by which it reaches him—convection, conduction, or radiation. But the control of radiant heat is totally different from the control of the others. If a man is subjected to radiant heat, air movement over the man will not reduce his heat load. Shielding with some reflective material such as aluminum may be required.

The physician should become acquainted with the high-temperature occupations in a plant. Workers with certain circulatory defects should be placed elsewhere. Since long-term physiological effects of working in heat do not seem to be serious and acclimatization is a very real factor, the physician would ordinarily refrain from recommending the alternating of workers between hot and normal-temperature operations.

An increase in the body temperature and pulse rate results from exposure to extreme heat. Since these effects are alleviated fairly promptly on removal to cooler areas, the physician should note whether such areas are available and utilized as required. If an air-conditioned rest room can be provided, recovery is considerably more rapid.[5] When the pulse rate does not decline sufficiently during a rest period in a cooler area, more effective control measures should be recommended.

In hot occupations the physician should observe whether an adequate water supply, with salt, is available for the prevention of heat cramps and exhaustion. Salt is usually taken in tablet form. Several varieties are sold, but the enteric-coated or impregnated type seems the most satisfactory. A cooled, salted water supply is sometimes used. One teaspoonful of table salt per gallon of water is adequate. Thirst is not an accurate indicator of how much water a man needs when working in extreme heat.

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His fluid loss will usually exceed the replacement induced by thirst. It has been said that one benefit of salt tablets is that they result in a man's drinking more water than would otherwise be the case.

Extremes of Temperature: Cold—Exposure to extreme cold may occur in meat-packing plants, in deepfreeze food producing and storage operations, and in flying at high altitudes. Provision of proper clothing is the principal factor to be noted. It has been stated[6] that acclimatization to cold has not been satisfactorily demonstrated. An investigation[7] of a group of 66 workers engaged many years in preserved-meat manufacture in cold rooms maintained at 0 to 2C showed a high incidence of chronic muscle and joint pains, and of upper respiratory tract involvement. Inquiry should be made of these possible manifestations of the effects of cold by the physician concerned with such exposure.

Ionizing Radiations—Ionizing radiations are finding increasing applications in industry. Inquiry should always be made as to whether radioisotopes or x-ray units are being used or whether it is contemplated they will be introduced. Some years ago industrial radiology was limited principally to the use of radium or x-ray for making radiographs of welds and metal castings for detection of flaws. Today a considerable number of radioisotopes are employed for a variety of purposes. Cobalt-60, a powerful gamma emitter, may be used instead of radium for radiography or it may be the source of gamma radiation in recording devices for liquid levels, or in a pipe-thickness gauge. Beta emitters such as phosphorus-32 may be found in thickness gauges for application of rubber coating or in milling of aluminum foil. Even alpha emitters have an industrial use where polonium-coated bars remove static electricity from printing press rolls and other machinery where static interferes with production or safe operation. Radium also continues to be used for this latter application. The risk of inhalation or ingestion of radioactive materials, particularly alpha emitters, should be checked. Radioactive sources and devices utilizing ionizing radiations can be used with safety where adequate precautions are observed.

The physician need not be an expert in the intricacies of ionizing radiation, but he should inquire into the schedule of monitoring exposure to radiation, and review the records of radiation levels within occupied areas and of personal monitoring devices. If exposure should exceed accepted values, he should call to the attention of management the seriousness of the injury that in time may develop. Factors involved in the proper handling of radioisotopes are outlined in a paper on surveying industrial plants for safe use of these materials.[8]

Illumination—In making a survey of any occupational environment, the adequacy of illumination should be observed. This would include intensity for a given operation and area, together with quality of illumination. This latter factor includes contrast, lack of glare, and proper brightness ratios, in respect to both artificial and daylight illumination. It is not contemplated that a detailed illumination survey will be undertaken by the physician. If his general observation indicates that the illumination is inadequate, the plant management should be referred to publications on industrial illumination[9] and advised to have an illumination survey made. In connection with the relationship of illumination to the visual demands of tasks, attention should also be directed to an adequate eye-examination program, and to suitable eye-protection equipment as well.

Harmful Operations

REPEATED MOTION—Injury may be caused by repetitious movements. Attention should be given to operations that may lead to bursitis and synovitis. Information may be obtained from the plant nurse as to whether such conditions have occurred and, if so, at which operations. The physician may be able to make pertinent suggestions for adapting the operation to the physiological and anatomic limitations of the human body.

Vibration—Compressed-air-driven hand tools are widely used in industry. In many plants the intermittency of the operation or other factors have prevented difficulty. If there has been some incidence of "white fingers" or if these tools are used routinely, reference may well be made to a paper by Dart[10] that covers this condition from the viewpoint of a practicing industrial physician. Heavy pneumatic tools such as jack-hammers reportedly may cause injury to elbow joints, but in this country cases have been few.

Accident Hazards

OPERATIONS AND CONDITIONS—If the survey is made in company with the safety engineer, more attention may be given to accident hazards. A check list of operations and conditions to be noted is given by Blake.[11] Unsafe acts of workers account for a greater number of injuries than do environmental conditions and machines, but both factors are involved in the majority of accidents. Information on accident hazards and their control can be gained by a review of the accident experience of the plant and through the plant survey, and also by attending plant safety committee meetings.

Sanitation

GENERAL—The American Standard on Sanitation[12] serves as a guide to general sanitation facilities. The physician should obtain information as to the state and local code requirements. Adequate maintenance and proper use of these facilities should be emphasized. Where difficult-to-remove materials get on the skin, the physician should learn what is provided for skin cleansing and in addition should observe what is actually used. Many a case of dermatitis is caused by use of solvents and harsh abrasive cleaners, even in plants where proper washing facilities and cleansing agents are provided.

Food Handling—Whether food handling is directly under the plant management or is the function of a catering service, the physician should observe the methods utilized. If foodstuffs are prepared outside the plant premises, the survey should extend to such locations. Methods of refrigeration and of keeping hot foods above the temperature of bacterial germination should be noted. One should inquire into use of foodstuffs after they have been standing in serving areas during mealtime. Garbage disposal

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should be checked. The storage and use of pesticides in and around food handling and storage areas should be inquired into carefully.

Not only is sanitation of importance in in-plant food handling areas, but also the nutritional adequacy of foods served by the cafeteria and selected by the employees should be checked. It is difficult to change eating habits, but, where food served appears to be nutritionally inadequate, this should be investigated and then proper recommendations made to management. A threefold approach might be suggested through offering balanced meals; making them attractive; and educating personnel in food selection, particularly those greatly underweight or overweight, as well as the diabetics and others who have to watch their diet carefully.

Hazard Evaluation

THE GENERAL survey of a plant will disclose some operations where hazardous materials are used under obviously safe conditions. Other operations may as obviously be hazardous and call for a recommendation to management that control measures be instituted.

In many instances potentially hazardous operations may be in progress that may or may not cause injury, depending upon the severity of the exposure. Control measures may be costly and management may be reluctant to incur such expense just to "be on the safe side," especially where competitors may not be adding the expense of such control to the cost of their product. In such a case, the question of whether a hazard actually exists may best be answered by recommending that the plant avail itself of expert professional survey services, which may include tests for atmospheric contaminants or of such biological materials as blood or urine, and recommendations for methods of hazard control based on their experience and technical findings.

Such services are available through official departments of industrial hygiene or occupational health in most of the highly industrialized states and in certain of the larger cities and counties. Private sources of these services are available and include a number of the larger casualty insurance companies, full-time consultants, and various professional and research organizations in the field of industrial health, including a number at universities.

Records of Conditions

AFTER the survey of the industrial environment, the physician should report to management his observations and recommendations. It would also be helpful to the physician to prepare his own record for his use concerning job requirements and health hazards in the plant.

This record should include the potentially injurious materials used or otherwise present; something of the intermittency or duration of exposure to them; and whether the exposure was normally under good control, obviously requiring control, or in need of technical study for its evaluation. The operations involving the potentially hazardous materials or conditions should be listed. A graphic means of associating hazardous materials and conditions with operations or departments consists of a chart on cross-section paper with the materials and conditions along the ordinate, operations or departments along the abscissa, and notations at the intersections indicating existence of the hazard at a given operation or department.

Control Methods

THE SURVEY of the plant should include a consideration of control measures, both medical and engineering, which are or should be followed in maintenance of a healthy work force and healthful working environment. It is not proposed that the physician include engineering control as part of his activities. However, an understanding of the engineering factors involved in the control of health hazards will enhance his appreciation of the over-all health aspects of plant operation. The more common control methods are as follows.

Medical Control

PREPLACEMENT EXAMINATION—The physician should ascertain the scope of the preplacement examination of all applicants for work and of special examinations of employees who are to be placed in an occupation involving exposure to some hazardous material. For example, employees to be placed in occupations involving exposure to pneumoconiosis-producing dust should be given a chest x-ray and those to be exposed to toxic substances should be given the same clinical tests that will later be used in periodic examinations, to provide base-line values.

Periodic Examination—The physician should also ascertain which special procedures are included in periodic examinations of employees in hazardous occupations and the interpretations of the findings. If the findings point to possible health impairment, inquiry should be made as to what conditions in the plant are to blame. The intervals at which these special procedures are conducted should be determined by the severity of the hazard and modified as the hazard is brought under control. The interval between chest x-rays should be related to the period required for the development of detectable changes.

Where a medical control program has been set up by one physician, it is advisable that another making a survey of the plant discuss his observations with that physician.

Engineering Control

PURPOSE—The physician making a plant survey has a proper interest in engineering control measures for a number of reasons. The decision of the physician in recommendnig the placement of a worker at a given operation or retaining him at his accustomed occupation may depend upon the engineering control measures. The physician may have completed an initial x-ray survey of a foundry group and among the core finishers noted one man with arrested tuberculosis. As foundry work is considered by many a physician to be a laborious, hot, dusty occupation, the first thought on reading the x-ray may be that this man may better be placed in some other industry. Consultation with the safety engineer or industrial hygienist or personal survey of this employee's work-

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place may disclose that his job is conducted while he is at a bench equipped with well-designed local exhaust ventilation, obviously resulting in no appreciable exposure to dust. On the other hand, if an employee subject to asthma is exposed to an organic dust to which he is allergic, and the only feasible control measure is a filter-type respirator (adequate protection for the man's fellow workers), the physician might well recommend that this man be placed in a more suitable location in the plant.

The interest of the physician in engineering control serves as a stimulus to the production and maintenance departments for provision of adequate control measures. The production superintendent is occupied with getting out the product; plant maintenance departments have a backlog of work that a foreman or superintendent is pushing to get done. Provision for control of health hazards is often deferred to the next day, and the next. The physician, in observing the state of control measures, might note that the elbow in an exhaust pipe was eroded and leaking, and find an explanation for the recurrent nosebleed of the chromic plater. When the physician emphasizes need for repairing the ventilating system through the proper channels, it is probable that action will be taken promptly.

Types of Control Methods—A number of categories of engineering control measures may be applied to reducing to safe levels exposure to hazardous materials. Where substitution of a less hazardous material is feasible, this should be done; for example, toluene for benzene as a paint diluent.

Alteration of method may serve as a control measure. This may involve a minor change such as installation of a motor-operated hoist to replace manual handling of baskets at a vapor degreaser or a major change such as replacement of beehive kilns with tunnel kilns for abrasive wheel calcining. In the latter case, the dust exposure is appreciably decreased and, in addition, efficiency of operation and quality of product are improved.

Isolation has application at many operations. One of these is the use of radioisotopes in well-shielded enclosures, with mechanical devices manipulated from the outside.

Ventilation is the most widely used method of engineering control. General ventilation refers to movement of air from an entire room or building. Local exhaust ventilation is usually more effective, as it is designed to capture the contaminating dust or gas before it escapes into the general room atmosphere.

Wet methods may serve as an effective means of dust control in certain operations. This may involve merely the use of garden watering cans to sprinkle the earth floor around a foundry molding area, or the installation of a high-powered water-sand blast for removal of cores from castings in place of the dusty operation of using pneumatic chisels. Good housekeeping, in itself, is an important control measure.

Personal protective devices have a real place as control measures. Although respirators should not be used as an inexpensive substitute for a local exhaust system, they may be recommended for operations where other control methods are not feasible and where there may be a severe exposure for a brief period. They may be used also as a supplement to other control methods. The type of respiratory protective device selected is extremely important and the physician would do well to learn specifically about the applications and limitations of such devices. Where toxic dusts or gases are present, or where the atmosphere is deficient in oxygen, devices approved for the particular exposure by the U. S. Bureau of Mines and as listed in their reports[13] should be used. Personal protective devices also include goggles, hard hats, gloves, plastic sleeves, asbestos leggings, and clothing made of aluminized fabric to ward off extreme radiant heat.

Conclusions

THE PURPOSE of this discussion has been to stimulate the interest of the physician in making surveys of plants with which he may be in contact, to suggest the manner in which he should approach such a survey, and to indicate the nature of conditions that should have his attention during the survey.

The facts obtained should influence the nature of the medical examination given workers, and findings of an examination should be interpreted in the light of such information. Care should be exercised in arriving at conclusions until there has been sufficient examination of all the facts. The mere presence of a toxic agent does not necessarily mean that the exposure is excessive or that injury will occur.

Examples of potentially hazardous materials and conditions, and the operations with which they are associated, have been included, but it is urged that the physician consult reference sources for complete details. This will place him in better position to appreciate what he sees during the survey and help him in constructive discussion with management.

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Industrial Medical Association

President's Page

IT HAS been my privilege and good fortune this year to attend industrial medical meetings in almost all parts of the United States and Canada. The friends I have met, the fine fellowship I have experienced, and the keen interest in industrial medicine which I have observed are memories I shall never forget.

Each meeting was different and always of the highest type. In each case the attendance was phenomenal. Every Conference brought forth some practical suggestion which could be taken back and used.

The Conference in Houston was excellent. Dr. Baird and his fellow members had an outstanding scientific program, and the southern hospitality was superb.

At Hamilton, Ontario, the combined Ontario and Quebec Convention of Industrial Physicians had an attendance of over 200. The papers that were read were constructive, with many original ideas. Who taught whom hospitality I do not know, but it was hard to beat!

At Pittsburgh one of our new component societies (Industrial Medical Association of Pittsburgh) had a one-day meeting with a wonderful attendance. The morning session was devoted to arthritis; it was most enlightening and valuable; the afternoon session was given over to various problems connected with industrial medicine. Dr. Rex Wilson and his Board have been instrumental in establishing an industrial section in the Ohio State Medical Association.

The New York State Society of Industrial Medicine had a timely meeting on radiation and isotopes. Radiation is one of the newer fields in industrial medicine and bids fair to be one of the most important. Much is to be learned about this expanding development, and it was gratifying to note the keen interest that has been aroused.

The industrial medicine division of the Southern Medical Society had an excellent panel discussion at the meeting in Washington. The interest and attendance were fine.

The Northwest Association of Occupational Medicine had an exceptionally good meeting. With the help of Drs. Holland and Shepard I am sure that many of their difficulties have been resolved. They have a fine, sincere and highly intelligent Board of Directors, and I am sure they will be able to solve all their problems.

The Central States Society of Industrial Medicine and Surgery had a first-rate meeting in Chicago with a large attendance and a top-flight program. The compliments to the Officers and the Program Committee were most enthusiastic.

The Conferences at University of Michigan in December and at Lake Logan in May were so unique that it would require too much space to describe them. Just let me say they will never be forgotten!

The postgraduate course at Miami University was one of the best planned and carefully managed courses that I have ever attended. Drs. Deichman and Marsh were superb in every way.

THE MEETING of the Board of Directors in St. Louis was reported in the Newsletter. It is always amazing to me that busy men give so freely of their time and energy for the benefit of the employer, the employee, and those interested in industrial medicine without any thought of recompense other than the satisfaction which comes from doing a good job.

The meeting in Los Angeles in February under the keen eye and discriminating management of Jerry Shilling and his associates of the Western Industrial Medical Association was an outstanding event in the development of the permanence and importance of the Industrial Medical Association.

For the opportunity and privilege granted me by the Industrial Medical Association of attending these meetings I offer my sincerest thanks. It has been a great honor and pleasure to have been your President during this last year.

E. S. Jones M.D.

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Industrial Medical Association

THE BOARD of Directors of the INDUSTRIAL MEDICAL ASSOCIATION, as provided in the By-Laws, have nominated one candidate for each of the offices of President-Elect, First Vice President, Second Vice President, Secretary, and Treasurer. The present President-Elect, JEROME W. SHILLING, M.D., will automatically succeed to the office of President at the conclusion of the Annual Meeting in April at St. Louis. At the Annual Business Meeting, April 24, the following nominees, whose pictures appear on the next page, will be voted upon: H. W. LAWRENCE, M.D., for President-Elect; D. JOHN LAUER, M.D., for First Vice President; R. E. ECKARDT, M.D., for Second Vice President; H. GLENN GARDINER, M.D., for Secretary; EDWARD C. HOLMBLAD, M.D., for Treasurer.

BALLOTS will be distributed at the door at the Annual Meeting, 3:30 P.M., April 24, 1957, Kiel Auditorium, St. Louis, to those Fellows and Members presenting their 1957 membership cards.

As further provided by the By-Laws, the Nominating Committee has reported two candidates for each of the vacancies on the Board of Directors for the years 1957-1959. Six Directors are to be elected for this term. The pictures of the 12 nominees appear on page 159. These candidates will be named on the prepared ballot; however, further nominations may be made from the floor and may be written on the ballot.

All of the men nominated have demonstrated their interest in the INDUSTRIAL MEDICAL ASSOCIATION and their willingness to work to promote the cause of the Association. There is good geographical distribution, and representation from the component groups.

Biographies

HERE are brief biographical notes on each of the nominees for IMA Directorships:

TRACY E. BARBER, Medical Director, George A. Hormel & Company, Austin, Minnesota; M.D., Temple University School of Medicine, 1943; IMA Member, 1949, Fellow, 1954, Counselor, District 17; State Advisory Board on Industrial Health, 1949-1957; Secretary, Board of Directors, Minnesota Academy of Occupational Medicine and Surgery, 1957; Program Committee, Central States Society of Industrial Medicine and Surgery, 1957.

L. E. CURTIS, Medical Director, Standard Oil Company of California, San Francisco; M.D., State University of Iowa, 1928; IMA Member, 1949, Fellow, 1955; Director, Western IMA; Member, API Medical Advisory Committee, 1948, Chairman, 1956.

GLENN S. EVERTS, Medical Director, Curtis Publishing Company, Philadelphia; M.D., University of Nebraska College of Medicine, 1924; IMA Member, 1944, Fellow, 1953, District Counselor, 1952-56, President, IMA of Philadelphia, 1952.

J. F. MCCAHAN, Medical Director, Loss Prevention Department, Liberty Mutual Insurance Company, Boston; M.D., Syracuse University Medical College, 1939; IMA Member, 1944, Fellow, 1951, Member, Small Plant Services Committee, Committee on Standards.

JAMES H. MCDONOUGH, Medical Director, Rome Cable Corporation, Rome, New York: M.D., University of Pennsylvania School of Medicine, 1942; Doctor of Industrial Medicine, University of Pittsburgh, 1950; IMA Member, 1948, Fellow, 1956; District Counselor, 1954-57.

ROBERT B. O'CONNOR, Medical Director, United States Steel Corporation, Pittsburgh; M.D., Harvard Medical School, 1939; IMA Member, 1951, Fellow, 1957.

ARTHUR K. PETERSON, Medical Director, R.R. Donnelley & Sons Company, Chicago; M.D., University of Illinois, 1936; IMA Member, 1948, Fellow, 1950, Secretary, 1950-54, Chairman, Committee on By-Laws, Vice President, Central States Society of Industrial Medicine and Surgery.

JAMES I. ROBERTS, Medical Director, New England Power Service Company, Boston, and Consulting Physician for affiliated and associate Public Utilities in New England; M.D., Tufts College, 1932; IMA Member, 1939, Fellow, 1942, District Counselor, 1952-57, History Committee, Problem Drinking Committee.

NORBERT J. ROBERTS, Associate Medical Director, Standard Oil Company (New Jersey), New York; M.D., University of Buffalo, 1940; F.A.C.P.; IMA Member, 1952, Fellow, 1957, Program Chairman, 1956 Convention.

THOMAS L. SHIPMAN, Health Division Leader, Los Alamos Scientific Laboratory, Los Alamos, New Mexico; M.D., Harvard University, 1932; IMA Member, 1940, Fellow, 1943; Director, American Industrial Hygiene Association, 1950-52.

WILFRED N. SISK, Director of Industrial Health, The Upjohn Company, Kalamazoo, Michigan; M.D., University of Wisconsin, 1935; IMA Member, 1946, Fellow, 1953; IMA Counselor, District 11.

WILLIAM G. THUSS, SR., Thuss Clinic, Birmingham, Alabama; M.D., Vanderbilt University, 1920, Founders Medalist; IMA Member, 1938, Fellow, 1941; F.I.C.S.; Medical Director, Employers Insurance Company; Associate Medical Director, State Farm Insurance Companies; Zone Surgeon, various casualty insurance companies; designated physician for Federal employees, etc.

Banquet Reservations

ADVANCE reservations for the Industrial Medical Association's Annual Banquet on April 24, 1957, will be taken until April 15, it is announced by John W. Berry, M.D., Chairman, IMA Banquet Committee. The Banquet will be held in the Gold Room of the Sheraton-Jefferson Hotel in St. Louis at 7:00 P.M. Roy Lattin, President, Mid-Continent Development Council, and former Vice President, Southwestern Bell Telephone Company, will address the assembly on a nonmedical subject; Joe Holland of St. Louis

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Industrial Medical Association

Jerome W. Shilling, M.D.
Pacific Telephone & Telegraph Company
To Become IMA President

H. W. Lawrence, M.D.
Procter & Gamble
Nominee for IMA President-Elect

D. John Lauer, M.D.
Jones & Laughlin Steel Company
Nominee for IMA First Vice President

R. E. Eckardt, M.D.
Esso Research and Engineering Company
Nominee for IMA Second Vice President

H. Glenn Gardiner, M.D.
Inland Steel Company
Nominee for IMA Secretary

Edward C. Holmblad, M.D.
Industrial Medical Association
Nominee for Treasurer

Industrial Medical Association

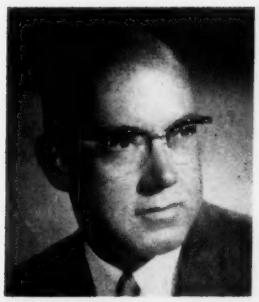
Nominees for the Board of Directors, 1957-1959 (Six to be elected)

Tracy E. Barber, M.D.

L. E. Curtis, M.D.

Glenn S. Everts, M.D.

Jermyn F. McCahan, M.D.



James H. McDonough, M.D.

Robert B. O'Connor, M.D.

A. K. Peterson, M.D.

J. I. Roberts, M.D.

Norbert J. Roberts, M.D.

Thomas L. Shipman, M.D.

Wilfred N. Sisk, M.D.

William G. Thuss, Sr., M.D.

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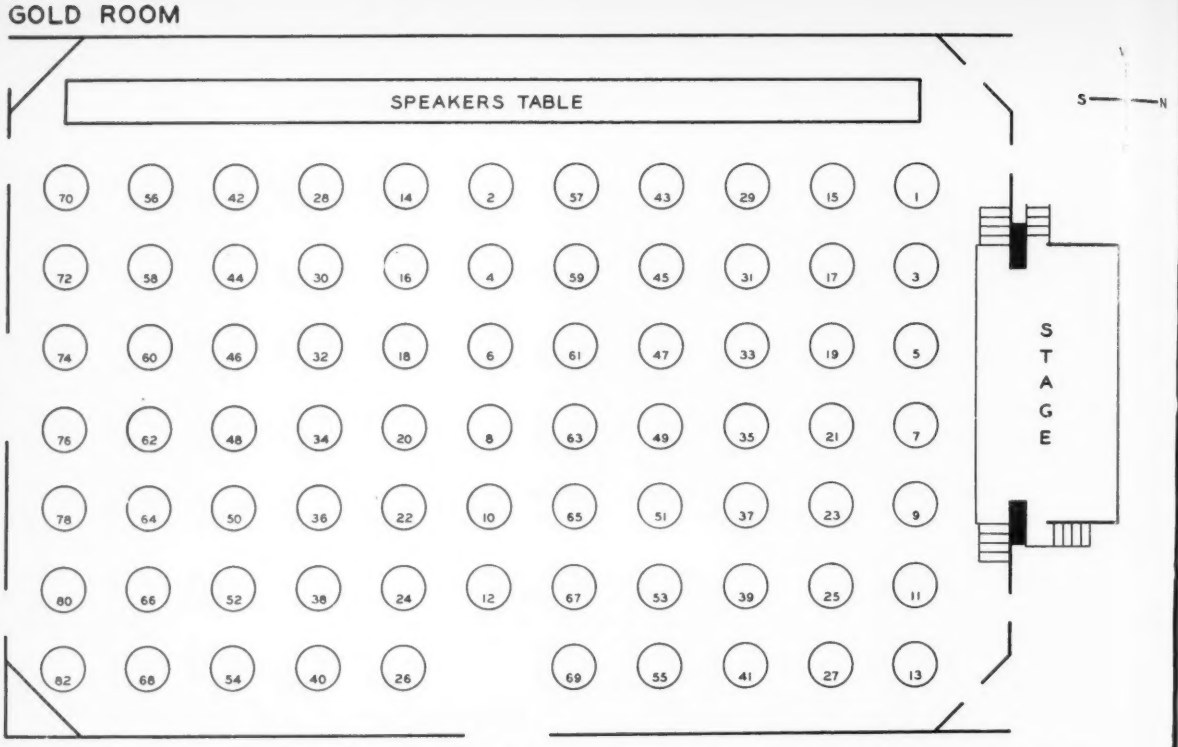

will be toastmaster. Each table will seat eight persons (see floor plan for table numbers), and the cost is $10.00 per ticket. Reservations should be sent to the Industrial Medical Association, 28 East Jackson Boulevard, Chicago 4, Illinois, and should be accompanied by remittance. Places will be assigned in order of receipt of applications. Tickets may also be purchased in the registration area of the Kiel Auditorium from Monday, April 22, until Wednesday noon, April 25.

Proposed Changes in By-Laws

IN ACCORDANCE with the By-Laws of the Industrial Medical Association, notice of proposed amendments is hereby given publication in the official journal of the Association 30 days prior to the date of the Annual Meeting.

Number of Directors

THE Committee on By-Laws, after due consideration and thought, recommends the following changes in the By-Laws be made and these changes be brought before the membership of the Industrial Medical Association at the next Annual Meeting in St. Louis, Missouri, in 1957.

Article IV, Section 2 reads: "The Board of Directors of the Association shall consist of the Officers and 12 elected Board Members."

Change to: "The Board of Directors of the Association shall consist of the Officers and 15 elected Board Members." (This change provides for 15 Board Members.)

Article VIII, Section 1 reads: "Immediately following the annual business meeting of the Members, the President shall appoint a Nominating Committee consisting of three Fellows from the Membership at large and three Presidents of Component Societies. The Nominating Committee shall nominate not less than two Fellows for each vacancy on the Board of Directors — six of whom will be for a term of two years, and shall also make nominations for any vacancies for unexpired terms which may need to be filled."

Change to: "Following the annual business meeting of the Members, the President shall appoint a Nominating Committee consisting of three Fellows from the Membership at large and three Presidents of Component Societies. The Nominating Committee shall nominate not less than two Fellows for each vacancy on the Board of Directors — five of whom shall be for a term of three years, and shall also make nominations for any vacancies for unexpired terms which may need to be filled." (This change drops the word "immediately" and also provides for Board of Directors terms of three years.)

Article VIII, Section 9 reads: "At each Annual Meeting there shall be elected to the Board of Directors six Fellows to serve for a term of two years, and other Fellows elected to serve as Directors to fill the unexpired terms when vacancies arise."

Change to: "At each Annual Meeting there shall be elected to the Board of Directors five Fellows to serve for a term of three years, and other Fellows elected to serve as Directors to fill the unexpired terms when vacancies arise." (This change also provides for three-year term Directors, five to be elected each year.)

It is believed that the interests of the Association will best be served by three-year term Directors, increasing the number to 15 in order to elect five new Directors at the Annual Meeting.

Favorable action taken by the Membership at the Annual Meeting in St. Louis in 1957 would permit

The activation of the changes in the By-Laws in 1958 when five new Directors would be elected for three years instead of six Directors for two years. This, of course, means that the Board of Directors would be composed of 11 Directors in 1958-59, 10 Directors in 1959-60, and 15 Directors in 1960-61 and thereafter.

It is also recommended that the booklet on By-Laws be reprinted if the proposed changes are approved by the Membership.

Dues Increase

IN ACCORDANCE with action taken at a meeting of the Board of Directors in February, 1957, the By-Laws Committee recommends the following change in the By-Laws of the Industrial Medical Association:

Article XI — Dues, Section 1 — The annual dues of Active Members shall be Twenty Dollars ($20.00) per year; of Fellows, Twenty-Five Dollars ($25.00) per year; and of Associate Members, Fifteen Dollars ($15.00) per year.

If this amendment is adopted by the members at the next Annual Meeting, all dues will be raised Five Dollars ($5.00) in each category of membership.

—By Laws Committee
ARTHUR K. PETERSON, M.D., Chairman
KOSME F. KAPOV, M.D.
EMMETT B. LAMB, M.D.
GEORGE WILKINS, M.D.

The Railway Surgeons

AMERICAN ASSOCIATION OF RAILWAY SURGEONS will hold its Sixty-Ninth Annual Meeting on April 9, 10, and 11, 1957, at the Drake Hotel, Chicago. The scientific sessions have the following program:

Tuesday Morning, April 9

DEBATABLE Tumors"—DANELY P. SLAUGHTER, M.D., Chicago.

"Practical Considerations of Jaundice"—FREDERICK STEIGMANN, M.D., Chicago.

"Injuries to Small Bones of Hand and Wrist"—JAMES R. REGAN, M.D., Milwaukee.

"The Treatment of Lesions of the Pancreas"—W. H. REMINE, M.D., Rochester, Minnesota.

Tuesday Afternoon, April 9

PANEL on "Return to Work Following Disabilities" —Moderator, JOHN B. HARTZELL, M.D., Detroit; Discussion by, WILLIAM BECK, M.D., Sayre, Pennsylvania; H. IVAN SIPPY, M.D., Chicago; and KENNETH A. CARNEY, Chicago.

"Common Diseases of the Skin"—LOUIS A. BRUNSTING, M.D., Rochester, Minnesota.

"Safety Measures to Minimize Auto Injuries"—A. L. HAYNES, Dearborn, Michigan.

Wednesday Morning, April 10

THE PROBLEM of Deafness"—MEYER S. FOX, M.D., Milwaukee.

"Pitfalls in the Treatment of Fractures"—ROGER ANDERSON, M.D., Seattle.

"Evaluation of Tranquilizing Drugs"—F. GARM NORBURY, M.D., Jacksonville, Illinois.

"Treatment of Stasis Ulcers"—HARVEY R. BUTCHER, JR., M.D., St. Louis.

Wednesday Afternoon, April 10

PANEL on "Duodenal Ulcer"—Moderator, GEORGE F. O'BRIEN, M.D., Chicago; Surgeon: LESTER DRAGSTEDT, M.D., Chicago; Psychiatrist: SAMUEL KRAINES, M.D., Chicago; Roentgenologist: JOHN UHRICH, M.D., Chicago; Internist: FRANK E. VAL DEZ, M.D., Chicago.

"The Treatment of Cardiac Emergencies"—CHAUNCEY C. MAHER, M.D., Chicago.

"Acute Conditions Simulating Arthritis"—WILLIAM K. ISHMAEL, M.D., Oklahoma City.

Thursday Morning, April 11

HOW to Examine the Low Back, and Interpretation of Tests Used"—CLAUDE N. LAMBERT, M.D., Chicago.

"Anxiety Tension States"—MARC J. MUSSER, M.D., Madison, Wisconsin.

"Preoperative Evaluation for Major Surgery"—ROGER D. WILLIAMS, M.D., Columbus, Ohio.

"The Surgeon and the Adrenal Glands"—JAMES H. HUTTON, M.D., Chicago.

American Academy

AMERICAN ACADEMY OF OCCUPATIONAL MEDICINE held its Ninth Annual Meeting at the Shoreham Hotel, Washington, D. C., February 13-15, 1957. The program was as follows:

February 13, Morning

PRESIDING—E. E. EVANS, M.D., President, American Academy of Occupational Medicine; Welcome — Honorable ROBERT L. McLAUGHLIN, Chairman, Board of Commissioners, District of Columbia; Greetings — RALPH M. CAULK, M.D., President, Medical Society, District of Columbia; "The Practical Aspects of Noise Control in Industry" (1) "Practical Aspects of a Hearing Conservation Program" — CAPTAIN LLOYD B. SHONE, M.C., U.S.N., Head, Industrial Health Branch, Department of the Navy, Bureau of Medicine and Surgery, Washington, D.C.; (2) U. S. Navy Program; "The Practical Aspects of Rehabilitation in Industry" — JOSEPHINE J. BUCHANAN, M.D., Chief, Department of Physical Medicine and Rehabilitation, District of Columbia General Hospital, Washington, D.C.

February 13, Afternoon

PRESIDING—JOHN LYNCH, M.D., Director, Employee Health Services, National Institute of Health; Greetings — JAMES A. SHANNON, M.D., Director, National Institutes of Health; "Practical Significance to Industry of Recent Developments in Infectious Respiratory Diseases" — ROBERT J. HUEPNER, Ph.D., Chief, Laboratory of Infectious Diseases; "Practical Significance to Industry of Recent Developments in Tuberculosis Management" — EDWARD BLOOMQUIST, M.D., Chief, Tuberculosis Program, U.S. Public Health Service; "Current Trends in Atherosclerosis Research" — JOSEPH H. BRAGDON, M.D., Section on Metabolism, National Institutes of Health.

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February 14, Morning

PRESIDING—THOMAS L. SHIPMAN, M.D., Health Division Leader, Los Alamos Scientific Laboratory, New Mexico; "The Biological Aspects of Radar" — THOMAS S. ELY, M.D., Assistant Chief, Medical Branch, Division of Biology and Medicine, U.S. Atomic Energy Commission; Panel on "Practical Aspects of Radiation Control in Industry": (1) "Regulation of Radiation Exposures by Legislative Means — Recommendations of the National Committee on Radiation Protection" — LAURISTON S. TAYLOR, Ph D., Chairman, National Bureau of Standards, U.S. Department of Commerce; (2) "Practical Aspects of Radiation Control in New York State" — IRVING R. TABERSHAW, M.D., Director of Health and Safety, Nuclear Development Corporation of America; (3) "The Eastman Kodak Company" — DAVID W. FASSETT, M.D., Director, Laboratory of Industrial Medicine, Medical Department, Eastman Kodak Company.

February 14, Afternoon

PRESIDING—LAMSON BLANEY, M.D.; Moderator — RONALD BUCHAN, M.D., Director of Employee Health, The Prudential Insurance Company of America; Panel on "The Practical Aspects of Recent Changes in Social Security Laws": U.S. Government — ARTHUR E. HESS, Asssitant Director, Bureau of Old Age and Survivors Insurance, Department of Health, Education, and Welfare, Baltimore, Maryland; Insurance Industry — JOHN H. MILLER, Vice-President and Actuary, Monarch Life Insurance Company, Springfield, Massachusetts; Employee Benefit Plans — ROBERT E. ROYES, Secretary, Employees' Benefit Committee, American Telephone and Telegraph Company, New York; American Medical Association — HENRY H. KESSLER, M.D., Medical Director, Kessler Institute for Rehabilitation, West Orange, New Jersey; "Recent Developments in Labeling Regulations" — A. H. HOLLAND, M.D., Director, Division of Medicine, Food and Drug Administration, Washington, D.C.; Annual Dinner Guest Speaker — L. E. BURNEY, M.D., Surgeon General, U.S. Public Health Service; The George Gehrmann Lecture; Academy Award.

February 15, Morning

PRESIDING—IRVING TABERSHAW, M.D.; "Practical Psychiatry in Industry" — ROBERT FELIX, M.D., Director, Institute of Mental Health, National Institutes of Health, Bethesda, Maryland; GERALD GORDON, M.D., E. I. du Pont de Nemours Company, Wilmington, Delaware; and RALPH COLLINS, M.D., Eastman Kodak Company, Rochester, New York; "Problem Drinking In Industry — Review of a Company Program" — S. CHARLES FRANCO, M.D., Consolidated Edison Company of New York; "Executive Health Programs" — ROBERT M. CLYNE, M.D., American Cyanamid Company, New York;

February 15, Afternoon

PRESIDING—"A New Portable Direct Writing Pneumatotachygraph" — ROBERT DeTREVILLE, CAPTAIN, USAF, (MC); "New Techniques in Teaching Occupational Medicine" — JEAN S. FELTON, M.D., Professor of Preventive Medicine, Department of Preventive Medicine and Public Health, University of Oklahoma Medical Center, Oklahoma City; "Unity of Services — The Safety Department, Supervision and the Medical Department, Unite Against Industrial Injuries" — IAN MacLACHLAN, M.D., Carrier Corporation, Syracuse, New York; "Conservation Hearing" — PAUL J. WHITAKER, M.D., Allis-Chalmers Manufacturing Company, Milwaukee; "Decompression Sickness (Compressed Air Illness) in Tunneling" — MORRIS KLEINFELD, M.D., Division of Industrial Hygiene, New York State Department of Labor, New York; "Absenteeism" — LEO WADE, M.D., Esso Standard Oil Company, New York; "Sodium Potassium Alloy: An Experimental Study of its Hazards" — ASHER J. FINKEL, Argonne Laboratories, Chicago.

Helsinki International Congress

THE PLANNING Committee for the International Congress on Occupational Health in Helsinki advises that hotel accommodations already are at a premium for the Congress dates of June 28-July 6, 1957. It is noted that a deposit of $11 in United States money is required to assure room assignment by the Committee itself. This sum may be forwarded to: Account 44785—XII International Congress on Occupational Health, Pohjoismaiden Yhdyspankki, Nordiska Foreningsbanken, Helsinki, Finland. Room reservations should be made before April 1st.

Likewise the Committee makes this statement as to fees covering regular dues and expenses for social events:

"Registration must be sent before April 1, 1957, to the congress office. Registration fees are 5.250 Finnish marks (approximately $16 United States Currency) for full members and 3.500 Finnish marks (approximately $11 United States Currency) for associate members. Will members kindly pay the fees in advance before April 1, 1957 to our bank, Pohjoismaiden Yhdyspankki — Nordiska Foreningsbanken, Helsinki, to account 44785 — XII International Congress on Occupational Health. After April 1 the fees are doubled. In case of cancellation before June 1, half of the fee will be refunded."

All persons (physicians, nurses, industrial hygienists, engineers, and others, including families) are urged to notify Dr. Robert T. Legge, 6 Roble Road, Berkeley 5, California, of their purpose to attend. All are urged to identify themselves with the United States delegation on arrival in Helsinki in order that some degree of homogeneity may attend the United States representation.

The official United States delegation and nominees will conduct their own planning meeting during the period of sessions of the Industrial Health Conference in St. Louis in April. The present delegation consists of: Robert T. Legge, Chairman; Carey P. McCord, Secretary; Heinrich Brieger; Max R. Burnell; Leonard Greenburg; Henry H. Kessler; Royd R. Sayers.

Nominations to the executive body of the International Commission have been made for the following persons as new members of the United States delegation: Seward E. Miller; Norbert J. Roberts; Theodore F. Hatch; Hedwig S. Kuhn; Sara P. Wagner; General Otis B. Schreuder.

All inquiries and correspondence (other than in payment of fees) sent to Helsinki may be directed to: Dr. Pertti Sumari, Secretary General, Organizing Committee, Haartmaninkatu 1, Helsinki, Finland.

In the United States all inquiries should be addressed to Dr. Legge, as above indicated.

The Program

THE TWELFTH International Congress on Occupational Health, has issued a program. Saturday, June 29, is Registration Day. On Sunday, June 30, a meeting of the Permanent International Committee on Industrial Medicine will be held. Monday, July 1, to Friday, July 5, will be devoted to the Reviews and Scientific Sessions — in Sections, Plenary Sessions, and Group Meetings — as well as to special events, dinners, receptions, films, concerts, and excursions.

The subjects of the Plenary Sessions are "Industrial Noise" — J. S. Lumio, M.D., Finland, and Dr. Eng. E. Koch, Germany; "Evaluation of Invalidity" — Professor G. Bergami, Italy; "Industrial Hygiene Norms" — Professor E. Escarrá, Argentina, and Charles R. Williams, M.D., United States; Symposium on "Human Engineering" — Professor T. Hatch, United States, F. Bonjer, M.D., Holland, W. T. Singleton, M.D., Great Britain, A. Lundervold, M.D., Norway, Professor E. Muller, Germany, Dr. Schleisner, Denmark, and Ing. B. H. Schulte, Germany.

The Scientific Sessions are arranged under four general subjects:

A. *General and Social Aspects*: "Cardiacs and Work" — Professor W. Zahorski, Poland; "Shift Work and Health" — Report of the Expert Committee of CIPPMT, E. Thiis-Evensen, M.D., Norway; "Industrial Back" — L. Hult, M.D., Sweden, and E. Cyriax, M.D., Great Britain; "Applied Psychology and Occupational Health" — Professor O. Oksala, Finland, and E. Mindus, M.D., Sweden.

B. *Occupational Pathology and Hygiene*: "Occupational Nonsilicotic Pneumopathies" — Professor M. Marchand, France; "Blood Diseases in Relation to Industrial Toxicology" — Professor S. Caccuri, Italy; "Toxicology of New Chemicals" — M. Goldblatt, M.D., Great Britain; "Isotopes in Toxicological Research" — R. Michon, M.D., France; "Problems of Internal Contamination with Radioactive Substances" — J. Muller, M.D., Czechoslovakia; "Diseases Due to Stress and Strain" — Professor E. Holstein, Germany.

C. *Industrial Nursing*: "Training of Industrial Nurses" — Miss H. M. Simpson, Great Britain; "Health Education in Industry" — L. A. Bravo, M.D., World Health Organization; "The Industrial Nurse With and Without Medical Direction" — Miss H. Parnanen, Finland; "Health Interviews in Connection with Physician's Examinations" — Miss G. Steward, United States; "The Industrial Nurse in a Generalized Public Health Programme" — Miss E. S. Brown, New Zealand; "How to Meet the Needs of the Small Factories" — Miss M. Walker, Canada.

D. *Open Session Subjects* (Occupational Dermatology, Ophthalmology, etc.).

The *Reviews* are: "Psychosomatic Medicine Considered from the Aspect of Social Security" — Professor G. Davila, Mexico; "Recent Advances in Industrial Ophthalmology — Hedwig S. Kuhn, M.D., United States; "Control of Chronic Diseases in Industry" — R. B. Robson, M.D., Canada; "Recent Advances in Silicosis Research" — Professor E. J. King, Great Britain.

There will be a Round Table Discussion on "Team Work in Occupational Health, led by A. Bruusgaard, M.D., Norway. Members: Mr. Joh. Fr. Hansen, Norway, Employer; Mr. Thure Flyboo, Sweden, Employee; Professor G. C. E. Burger, Holland, Industrial Physician; Professor E. Grandjean, Switzerland, Teaching and Research; Professor V. Vouk, Yugoslavia, Industrial Hygienist; Donald Stewart, M.D., Great Britain, Rehabilitation; Jon Bjrnsson, M.D., Norway, Public Health; and Miss R. Saynajarvi, Finland, Industrial Nurse.

The Group Meetings will be divided into 19 general areas of interest; each group will meet separately at a Luncheon given by Finnish hosts. At the Luncheon, an address will be delivered on some topical subject. Following the luncheon, an excursion will be made to some of the institutions, factories, etc., representative of the branch.

The Luncheon Addresses include "Teaching of Occupational Health in Universities" — Professor Enrico C. Vigliani, Italy; "The Activity of American Industrial Medical Association" — E. C. Holmblad, M.D., United States; "Industrial Nursing and Its Future" — Miss Sara Wagner, R.N., United States; "International Review in Industrial Nursing" — Miss R. Durrant, Great Britain; "Recent Advances in Rehabilitation" — Henry H. Kessler, M.D., United States; "Wie konnen die Krankenversicherungsanhalten die Arbeitsmedizin fordern" — Obersanitatsrat E. Tuchmann, M.D., Osterreich; "Actual Health Problems of the Petroleum Industry" — R. Schneider, M.D., United States; "Actual Health Problems in South African Mines" — A. J. Orenstein, M.D., South Africa; "Actual Health Problems in Chemical Industry" — P. Pelnár, M.D., Czechoslovakia; "Uber die Gesundheitsproblem in der Landwirtschaft" — Professor N. Timar, Hungary; "Recent Trends in Accident Prevention" — I. L. O. representative; "Medical Factory Inspection, Retrospect, Suspect, and Prospect" — E. T. A. Merewether, M.D., Great Britain; "Occupational Health in International Airline Operation" — Otis B. Schreuder, M.D., United States.

On Saturday, July 6, there will be professional excursions to any of a number of interesting medical centers in Finland or surrounding Scandinavian countries, or tourist excursions to points of general interest in Finland or other nearby countries.

Books

A Clinical Approach

THE ACCIDENT SYNDROME: The Genesis of Accidental Injury: MORRIS S. SCHULZINGER. Charles C. Thomas, Publisher, Springfield, Illinois, 1956, pp. 234, $6.50.

When the author was a young physician and without many patients coming to his small industrial medical clinic, he instituted the practice of taking elaborate social histories even when the injuries were trifling. He noted whether the neighbors upstairs

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had a party the night before, whether the patient quarrelled with his wife or girl friend, along with many other similar and sometimes seemingly irrelevant matters. By the time the better days arrived, the habit so well had been established that it was continued. Twenty years later there had accumulated some 35,000 injury records, both industrial and others. It is unlikely that any hospital, although perhaps caring for several times this number of patients, ever had any large number—and certainly no comparable number—of injury histories procured by any one intern, resident, or assistant. Hospital records are likely to be a heterogeneous lot, with little uniformity.

The author had gone about this pursuit without any well-defined objective. The practice was more of a habit than a planned procedure. Yet, 20 years later, his compilation was discovered to be a scientific gold mine — a mass of material inviting probing as to the background out of which accidents arise. Not being a statistician, the author wisely sought statistical guidance and utilized it. His data were analyzed in many categories, but even now not to the exhaustion of possibilities. Out of this experience and these analyses has derived this book; and in this book are many forceful statements, usually documented, all to the end that an accidental injury in itself is merely a culmination, and oftentimes an inevitable culmination, of single or multiple factors temporarily or more or less permanently in the background of life. This is reflected in a few cogent observations:

Only about 10% of all accidental injuries solely are attributable to fortuitous circumstances.

The idea that a lifelong state of accident proneness largely is a fallacy, although there are exceptions, and, contrawise, that proneness to accident may represent a fleeting period of time.

The old idea that accidents occur in multiples is somewhat substantiated. Accidental injury breeds accidental injury.

Given a set of circumstances of unfavorable nature, with fair fidelity it is possible to predict the coming of an accidental injury, but the background is more important than the injury itself. The injury serves chiefly as the trigger mechanism for the impending disaster.

All appraised, the accidental injury becomes a part of a syndrome, with many factors contributing to its occurrence.

The author believes that the practices of the safety engineer along mechanical lines which never must be abandoned and were highly contributory to betterment in the past, have well-nigh reached a saturation point, or a plateau line on any graph. Likewise it is the author's belief that group education, whether in schools, through newspapers, posters, etc., without decrying its value, has reached the same plateau. On the positive side, it is the author's thesis that the great opportunity for the next surge in accident prevention, whether in the home or on the highway or at the work place, falls into the domain of clinical medicine and more particularly into the domain of the highly practical functional psychiatrist, but admitting that every physician aware of the requirement may take a hand. The American Medical Association, through official action, has voiced its concern over accidental injuries, notably traffic injuries, and has alerted its constituency to action. This call to action will be heeded, and at every turn much that is provocative and useful will be found in this book devoted to "The Accident Syndrome."

Noise

INDUSTRIAL DEAFNESS: JOSEPH SATALOFF. Blakiston Division, McGraw-Hill Book Co., New York, 1957, pp. 333, illustrated, $8.00.

Industrial medicine long has been confronted with a succession of unusual situations that for the time being became the focus of widespread attention and action. For a while, silicosis occupied the center of the stage. After Hiroshima, grave concern centered about radiation damage. For a period in the middle "thirties" lead poisoning was near rife. Currently and for some years past, the scene stealer has been noise and noise deafness, and particularly claims for noise deafness. On this account this book is a part of the immediate.

The major title of this work tends to mark it as strictly medical. Factually, little of it is clinical. Sections are devoted to the anatomy and physiology of the ear, the physics of sound, the measurement of noise, noise control, the legal situation as to compensation, etc. The physician may share this book with the safety engineer, the industrial hygienist, the compensation department, and the industrial nurse. Much of the text was written by nonphysicians.

Some hearing loss is a product of aging. Presbycusis is the rule and not the exception. Often this has provided a dilemma in appraisal of the merits of hearing loss claims among older workers. At any age, hearing deficiencies may arise unrelated to work as the cause. It is no easy matter at times to make proper discrimination between occupational and nonoccupational deafness. In at least one compensation jurisdiction it is assumed that all older workers will have suffered some hearing loss on an aging basis. Consequently a formula has been devised whereby 0.5% of the total loss is deducted for every year of age beginning at 50.

The editor cautiously denies any other damage than the possibility of hearing loss after noise exposure, but recognizes noise annoyance as significant however much of an imponderable.

No record has been reached among noise investigators and otologists as to a suitable level of noise at any frequencies that should serve as standard, below which level damage is not expectable. Awaiting agreement, many in responsible posts advocate an across-the-board figure of 90 decibels. This volume runs away from that figure, leans toward 100 decibels, prefers consideration of frequency as one element of standard setting, and shows no sign of panic when the noise level is at 110 decibels.

This book is without bias, although prepared by a group chiefly associated with management. More than a little comfort is handed the employer harried by noise deafness claims. Little comfort indeed is proffered the professional promoter of noise deafness claims. Noise deafness is attaining to a ponderable status, and this work makes many contributions toward that achievement.

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Recruitment of Physicians for Industry

AT NO forseeable time may it be expected that educational agencies throughout the land will complete the training of industrial physicians in numbers anywhere near the demand. It may be estimated that now there exists a need for some 5,000 additional physicians to serve in industry. The registered demand is nowhere near that figure, however, actual demand is such that educational institutions continuously are embarrassed that the yearly output of trainees does not amount to 10% of the earnest overtures originating in industry for new industrial medical personnel.

Since formal education in occupational health promises little toward the furnishing of the full complement of physicians needed in industry, resort must be had to the recruitment of able physicians without any formalized education in that specialty. It is granted that this is not the optimal route into industrial medicine, although just serving in industry becomes an education in itself. The greater number of present-day leaders in occupational health had no education in their specialty beyond the day-by-day experience over the years. So it may be believed that, in the presence of need for industrial medical services, any physician of good character and good general medical training is far more valuable than no physician at all.

It is conceived that unfailingly over the land are large numbers of skilled young physicians in private practice, and successful in that pursuit, who likely would transfer into the highly dramatic opportunities of occupational health should they know of such opportunities. Assurance may be afforded that the eager hardworking ones admirably will fit into the requirements of industrial medicine even though there be deficiency in specialty training. These physicians will not be saddled with any ignominy as second-class practitioners of occupational medicine. The only aristocracy in this field is the status afforded by specialty certification. The majority of industrial physicians as yet have not attained to specialty certification, although many are eligible to undertake Board examinations and even larger numbers after sufficient length of service will become so eligible. In time these medical recruits from general practice may attain to Board status, although that road may be a hard and long one. Many of the small number of formally-trained industrial physicians themselves are ineligible for Board recognition because of insufficient years in medical service in industry.

CAREERS in occupational health are not without their blessings and superiorities. Incomes, while not always equal to the returns from private practice, are earned less arduously. The hours of required attendance are finite, and usually are not more than eight. Opportunities for research within industry itself are limited only by the capacities of the individual physician. In many respects a large industrial plant is an informal university. The tempo of industrial medicine, as a specialty, is livelier than any other at this time, and the tempo quickens year by year. Distinction is more readily achieved in occupational health than in private general practice—and this statement is equally true for many of the other specialties in medicine. If distinction is sought, occupational health is not lacking in overtures to come, and toil, and achieve. And those who do come will find willing and expert guidance from the many

who already have attained their own eminence.

The difficulty that attends recruitment into this field is twofold. The young physician, busy in his successful pursuits, is little aware of what industrial medicine has to offer. Contrawise, industry itself and the physician already prospering in that domain little know who these prospective recruits are and where they may reside. Over the land there are some hundreds of County Medical Societies that maintain Committees on Occupational Health, although many are unblessed by records of intensive activity. If these Committees did nothing but turn on the lights so that the ambitious young physicians about them would clearly perceive the wider horizons and more brilliant careers offered by medical services among the 66 million workers who ply the trades of industry, they would justify their being.

ASA's Z37 Committee

EIGHTEEN years ago, the American Standards Association led to the organization of a committee for the provision of standards of acceptable concentrations of toxic dusts and gases. This Committee has become known all over the country as Z37. The A.S.A. creates no standards. Merely it sponsors and promulgates standards as are agreed upon by highly skilled committee personnel in the many areas of standard needs.

The A.S.A. standards have no legal standing and no measures for enforcement. None is wanted. None is desirable. Over the years many of the standard provisions of A.S.A. have been written into laws in this country, but consistently this is frowned upon since standards should be labile and subject to modification as justification develops. Once a standard is written into a law, it becomes most difficult to bring about modification within the enactment even though sound reason therefor is manifested.

Within the lifetime of Z37, some 38 standards have been formally agreed upon or are well under way toward final agreement. Some of these standards were developed on an emergency basis for application during the Second World War, and a number of these war standards have been rescinded or modified. Prior to the adoption of any standard by Z37 there must have been substantial scientific work somewhere over the world that carried conviction to the Committee that the findings were valid. Many other standards promulgated over the land by other agencies are based upon the consensus of numerous skilled individuals working in the field. Not in all instances have these opinions been predicated upon precise scientific exploration. This different attitude in a measure accounts for the relatively small number of standards sponsored by A.S.A. in the field of toxic dusts, gases, and vapors.

As an example of the rigorous scientific exploration prerequisite to an A.S.A. standard, carbon tetrachloride may be utilized. For more than 10 years the Z37 committee debated the proper maximum level of concentration regarded as tolerable for prolonged exposure of workmen. In the early days there was some disposition to accept the standard of 100 parts carbon tetrachloride per million parts of air, over an eight-hour work period. When finally and much later accord was reached, the proposed standard was set at 25 ppm of air by volume. In the meantime, carefully conducted experimental work leading to the conclusion of the safe upper limit was reflected in the figure adopted.

After more than 10 years of earnest debate the Committee is still without agreement as to a suitable standard for silica dust exposure. This situation appears because of so many variables that complicate the matter — the size of dust particle responsible for injury, deficiencies in the method of enumeration, the percentage of silica in the parent mineral, individual differences in human susceptibility, difficulties in the diagnosis of silicosis in humans, etc.

WITHIN the lifetime of the Z37 Committee the personnel and agencies represented have undergone many changes. Currently the Committee is composed of 40 members (including alternates) who represent the scientific or manufacturing bodies now listed: American Conference of Governmental Industrial Hygienists; American Industrial Hygiene Association; American Institute of Chemical Engineers; American Petroleum Institute; American Public Health Association; American Society of Safety Engineers; Association of Casualty and Surety Companies; Canadian Standards Association; Conference of State and Provincial Health Authorities of North America; Department of Health, Education and Welfare — Public Health Service; Industrial Medical Association; International Association of Governmental Labor Officials; Manufacturing Chemists Association; National Association of Mutual Casualty Companies; National Safety Council; U. S. Department of the Army; U. S. Department of the Interior — Bureau of Mines; U. S. Department of Labor — Bureau of Labor Standards.

It may be contended that the number of standards devised or under way resulting from the deliberation of the Z37 Committee is small in the light of the need for many hundreds of standards that might well influence the use of the almost unlimited number of chemicals known to industry. Offsetting this possible contention is the fact that when the Z37 Committee, and later the A.S.A. itself, sponsors a standard in the field of toxic dusts, gases and vapors, that standard represents the mature opinion of a stalwart group of scientists that unswervingly demands scientific proof as the basis for its pronouncements.

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